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DODGE

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CHEVROLET

Please send me a Vacu-matic for a Model A. The mileage on my 1933 Chevrolet jumped from 18 to 22 miles per gal. with Vacu-matic. —Paul P. Haas, Mass.

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Have been using the Vacu-matic for a month. I used to get 20 to 22 miles per gal. Now I get 30 to 33 miles. It is amazing the difference it makes.—James W. Barr, Canada.

OLDSMOBILE

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IF THE *Telephone* WERE NOT THERE!

MANY times each day you reach for the telephone on your desk at the office or in its familiar spot at home. It is an old and trusted friend. You scarcely give a thought to what it means to a busy day.

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February, 1935

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'Round-the-World Air Service

AVIATION'S fondest dream—air service around the world—is rapidly coming true. For a year the Graf Zeppelin has been making regular trips between Europe and South America, the forerunner of a similar service between Germany and the United States. Now a group of huge flying boats is being built to ply between California and China, there to connect with European continental air lines. An article in the March issue describes how, by using these interconnecting lines, you will soon be able to fly from California to London in two days, or circle the earth by air in two weeks.

Next Month

MUCKERS and sand hogs, engineers and blasters, are boring another hole under the Hudson river to supplement the Holland tunnel in handling the increasing auto traffic between New York and New Jersey. An article in the March issue takes you down into this strange underground world where lives depend on air pressure, where you can't whistle, where you can't even blow hard enough to extinguish a candle.

Topsy-Turvy Drivers

"LUCKY" TETER earns a living by turning cars upside down at seventy miles an hour. He is one of a crew of stunt drivers who create handmade wrecks to demonstrate the ability of the modern car to take punishment. In the March issue he takes you for a ride and a wreck. The article is accompanied by eight pages of thrilling Colorado pictures.

Eyes of the Air

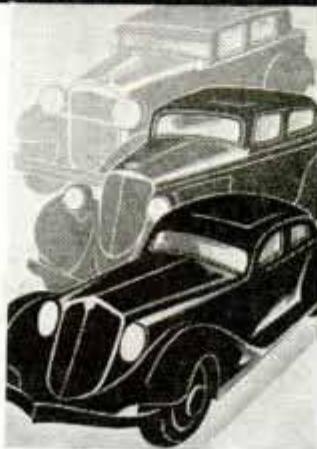
THE aerial camera, a wartime development of science, is busy today at a thousand peace-time tasks. An article in the next issue describes how the flying camera is aiding in the construction of a giant bridge, in fighting soil erosion, and ferreting out the secrets of a prehistoric race. And the story reveals there is an actual shortage of competent aerial survey photographers.

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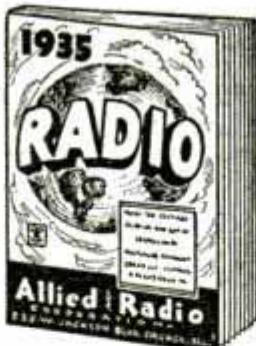
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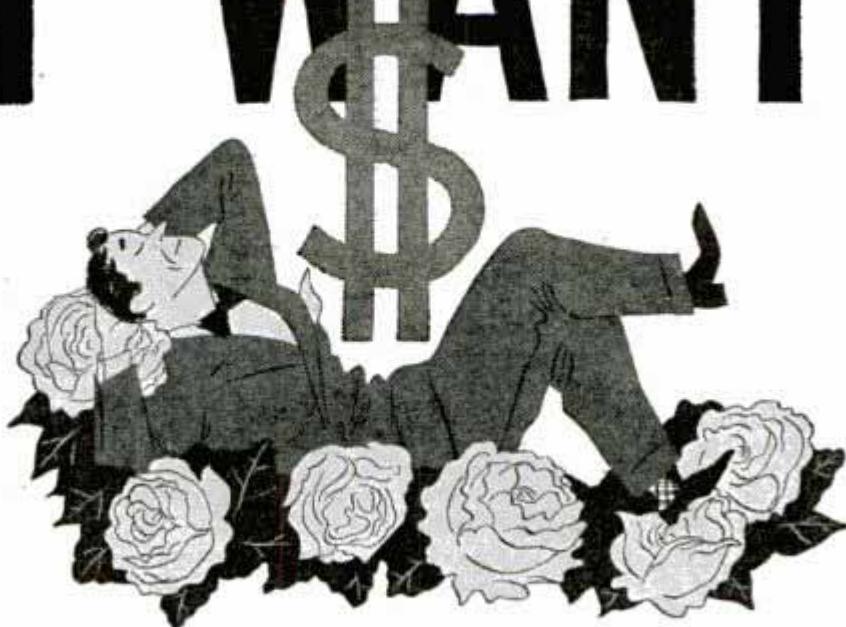
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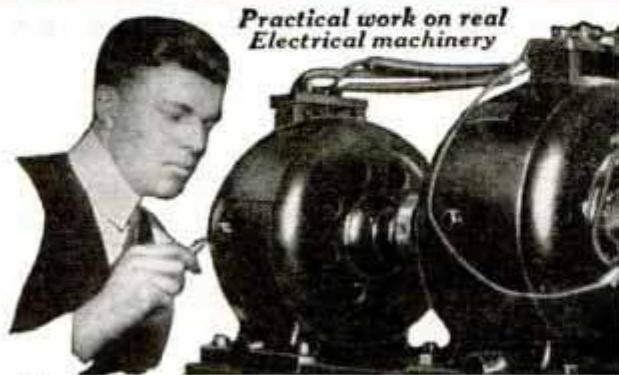
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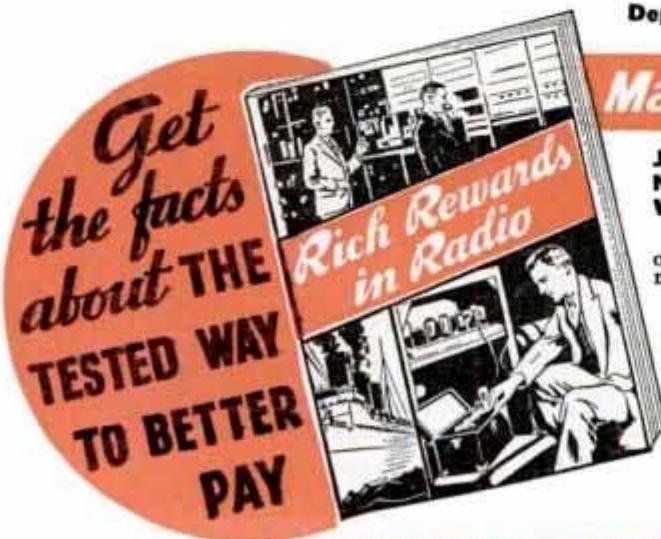
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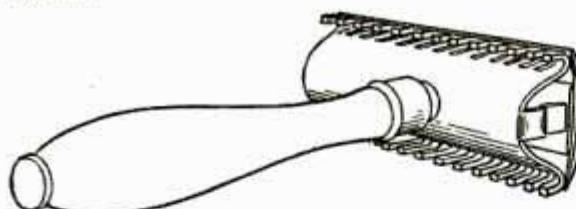
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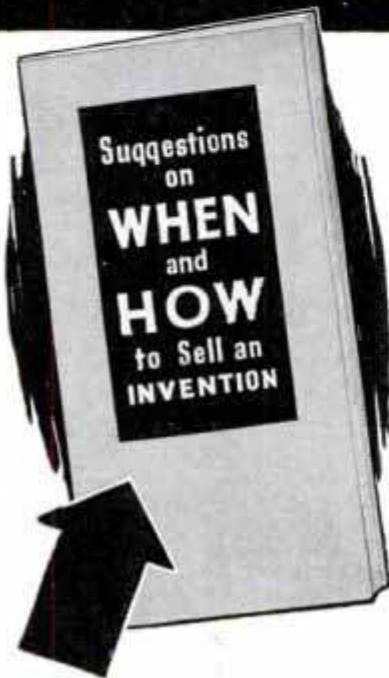
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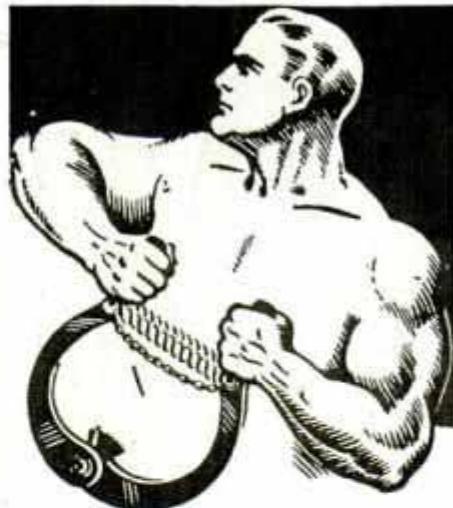
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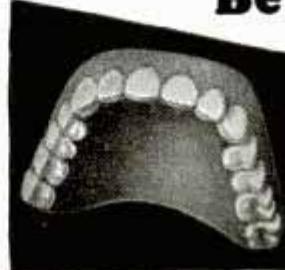
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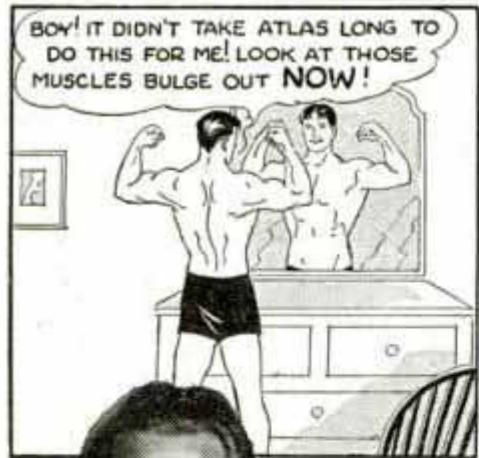
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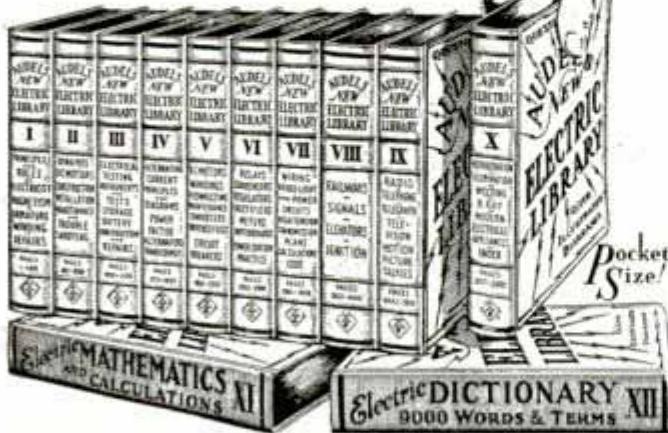
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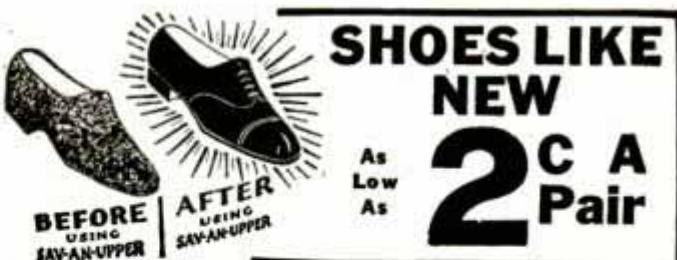
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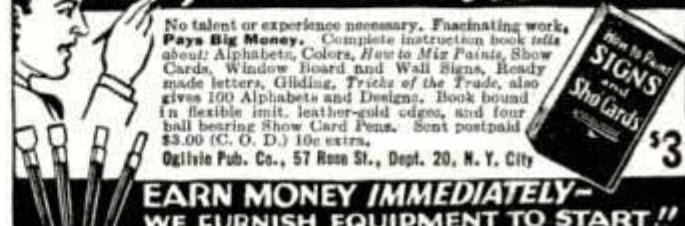
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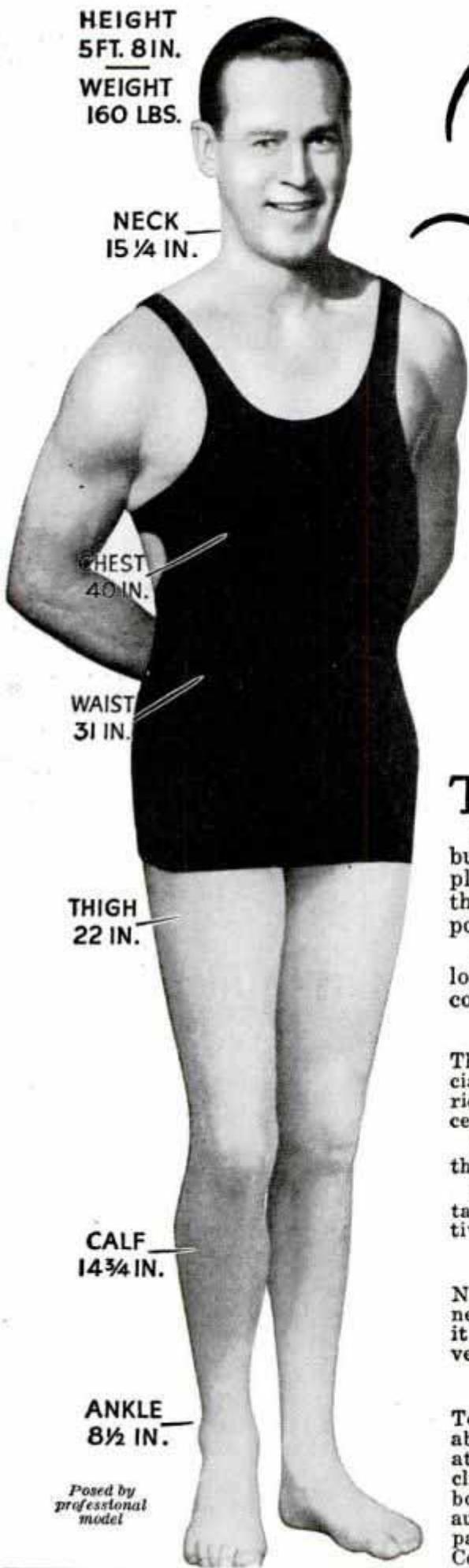
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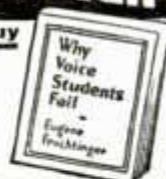


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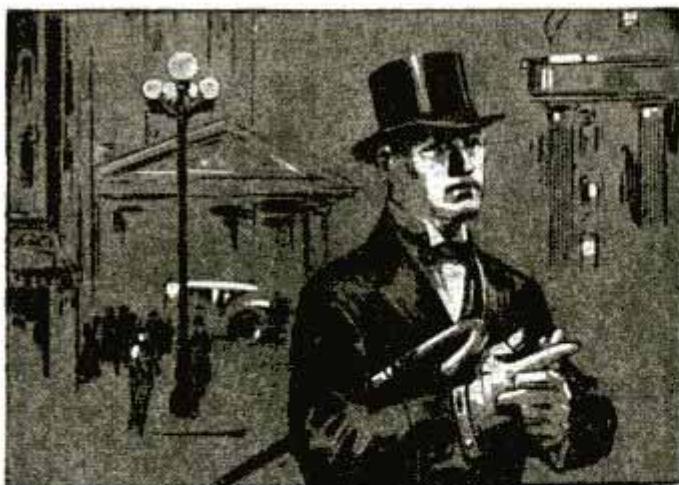
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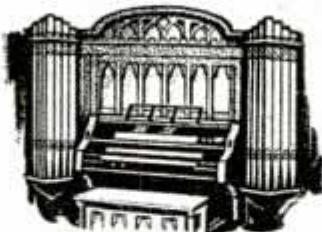
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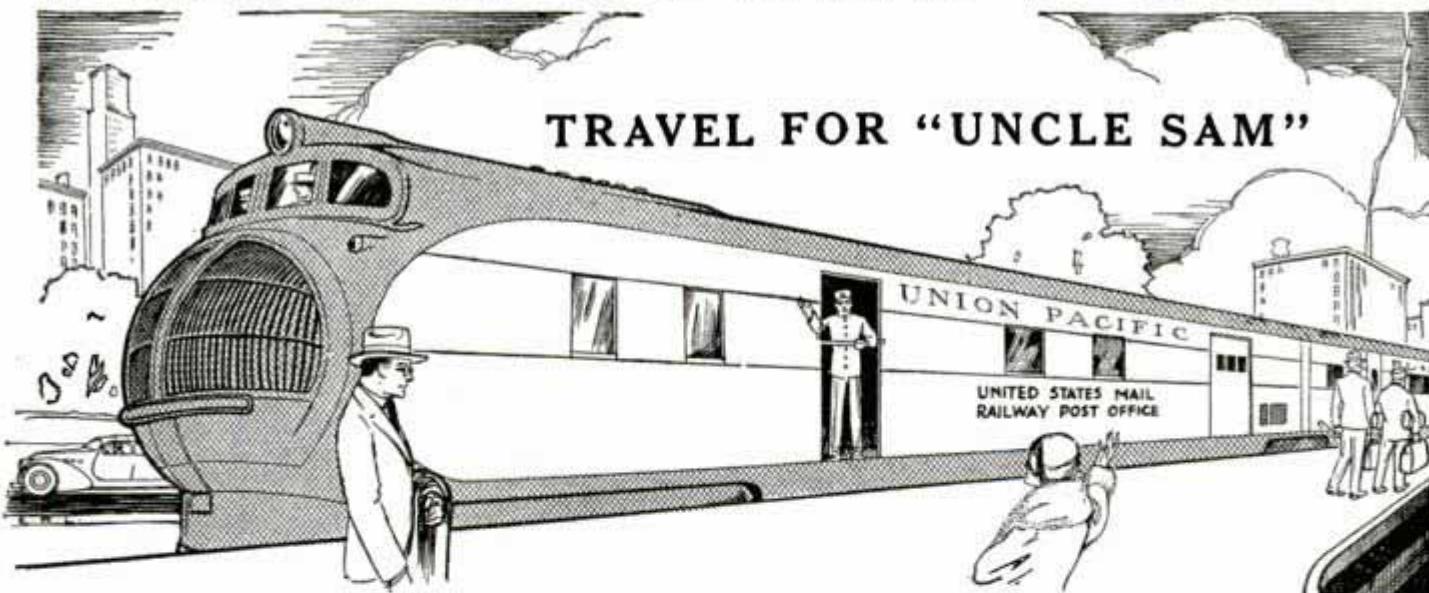
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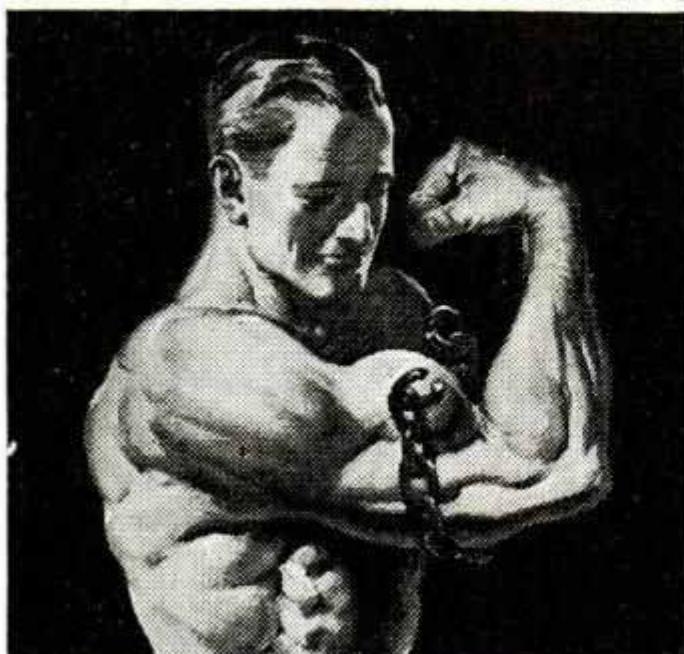
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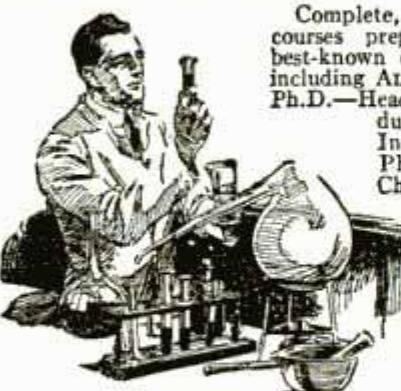
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TURN Old school books into money. Instructions 20c. National Textbook Co., Charlotte, N. C.

DOLLARS Daily; operate home mailorder business. Details. Duffy, Corington, Ky.

"SCHEMERS Magazine," Alliance, Ohio, prints schemes, ideas, business starters, formulas; winners—\$10,000 to \$50,000 reported. 37th year, \$1. Subscribe now. Six months special, only 30c.

MAKE Miniature pottery novelties. Instructions 10c. "Curtis," 3329 Lafayette St., Denver, Colo.

START A mail order business, in your own home. Particulars free. Dixie Makers, King, N. C.

CASH Income resilvering mirrors; repatting metalware; making glass signs. Portable outfit. Sprinkle, Plater, 127, Marion, Ind.

EARN Quick cash raising mushrooms in cellar, shed, attic. We buy crops. Guaranteed materials furnished. Easy, odorless method. Book free. United, 3848-D Lincoln Ave., Chicago.

MAKE Money. Learn secrets of professional photo coloring for only \$1.00. An easy way to make good money. Currency or M. O., no checks. Money back if not satisfied. Home Studies, Ltd., Room P-1, 812 Huron Road, Cleveland, Ohio.

RUBBER Mold owners make copper plated articles in rubber molds. Instructions \$2.00. M. Lee, 3500 Centennial Blvd., Nashville, Tennessee.

WE Make synthetic rubber molds to order. Low prices. All branches marbleizing and mold making taught. Dime brings miniature mold, assorted marbleized and rubber samples. How to get Roosevelt bust mold and cast (free). Literature. Cowell Institute, Grayling, Mich.

BIG Money at home plating auto parts, reflectors, mirrors, chandeliers; by new method; experience unnecessary. Outfits furnished. Gunmetal Co., Ave. N., Decatur, Ill.

FREE Circulars describing how you can make big money in mail order business at home in spare time. Write today. Mail Order Institute, 669-H Marcy Avenue, Brooklyn, N. Y.

BIG Profit hand engraving rubber printing plates. Sell printers and advertisers. Complete instructions, dime. August Becker, 22 Hale Avenue, Brooklyn, N. Y.

SWAP! Sell! Anything! Anywhere!! 4 months, 10c. Traders-Exchange, Brookings, South Dakota.

GROW Mushrooms all year round—a steady income indoors, in cellar, shed or stable. Exclusive new process. Bigger, better, quicker crops—more money for you! Book free. American Mushroom Industries, Dept. 971, Toronto, Canada.

SOAP Making, learn at home. No machinery needed. Write Pozora, Station F, Milwaukee, Wis.

GLASS Substitute easily, cheaply made. Guaranteed formula 50c. Ralph Brooks, Arkansaw, Wis.

FIRMS That sell wholesale. Names, addresses, 10c. International Agency, P-2, Cincinnati.

PROFIT With new products. Make, sell, repeat. Guaranteed formulas, special prices, leads. Biggest catalog free. Gibson, Chemist, BD-4702 No. Racine, Chicago.

A FORTUNE Awaits you! New formulas for establishing business at home in spare time. Particulars free. Hetzel, 802 Garden, Hartford, Conn.

SEE Our display advertisement on page 137A this issue. Rapaport Bros., 703 West Ohio, Chicago.

OVER 100,000 Articles wholesale. Directory 10c. A-Wepeo, 3705 University, Des Moines, Iowa.

EARN While learning—men—women—your own cleaning—pressing business. Easy home training. Free outfit offer. Write B-51. Business Ownership Institute, 2400 Madison, Chicago.

WILL Put you in business without investment. Postal brings particulars. New Deal Associates, 516 - 5th Avenue, New York.

SCREW-HOLDING Screw drivers! Not magnetic! Remove, hold, insert screws in inaccessible places. Factories, garages, electricians, mechanics, radio, autoists buy; no competition! Quick sales, big profits. Exclusive territories; also foreign. Toolco, 5068 Winthrop Bidg., Boston, Mass.

"PROSPERITY" For home workers. 5 pages monthly. Sample, 10c. Sizemore, 4917 N. Kostner, Chicago.

SIGNS And showcards easily painted with letter patterns. Large variety of styles and sizes. Write for free samples. John Rahn, A-2120 Neva, Chicago.

SUCCESS! "Key to Greater Earnings" tells how. 10c coin, refundable. Roberts, Box 121A, Oakland, Calif.

GREATER Earnings! Home, office. Particulars free. Hochman, 269 West First, Mt. Vernon, N. Y.

FAMOUS Bailey Handbook—Prepares you to pass the examination for any grade o license for stationary, marine and Diesel engineers, firemen and boiler inspector in any state of the Union or any province of Canada. Flexible cover. Handy pocket size. Pay postage \$2.00 plus postage when hands you the package. Popular Mechanic Press, Room 802, 200 E. Ontario St., Chicago, Ill.

PLASTEX Industries offers industrious men an opportunity to start a business o their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. You are just in time for big Christmas business now starting. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

"THE Key to Business Opportunities" free. Goodall, Box 1592, San Francisco.

SIGN Painting made easy with letter patterns. Samples free. Clark, Ellwood City, Pennsylvania.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950 W. Broad, Richmond, Va.

SUCCEED With your products. Make-sell them. Formulas. Processes. Analytical service. Catalog free. B. Thaxby Co., Washington, D. C.

FREE—Books, mail order business. Stamp appreciated. Dolson Herald, 36 Liberty Street, Brooklyn, New York.

OPEN A key-making shop. Start a permanent profitable business with a small sum. No skill necessary. Write for particulars. Beisser Mfg. Co., 411 E. Fort, Detroit, Michigan.

CHARTERS: Delaware; best, cheapest free forms. Colonial Charter Co., Wilmington, Del.

LEARN All about casting marble novelties in rubber moulds. Cement secrets. Illustrated catalog and beautiful samples 3c (So. Calif. business reserved.) John A. Payne, 915 Grande Vista Avenue, Los Angeles, Calif.

TWELVE New successful money-makers. J. Home, 3949 Metropolitan, Chicago.

CHEMICAL Expert will furnish formulas and trade secrets. All lines. Lists free. W. L. Cummings, Ph. D., 228 Gordon Ave., Syracuse, N. Y.

START Little business anywhere. Every thing furnished. No canvassing. Maywood, PM 923 Broadway, New York.

SELL By mail. Books, novelties. Bargains! Big profits. Particulars free. B. Elfeo, 525 S. Dearborn, Chicago.

FREE Booklet describes 87 plans for making \$20-\$100 weekly, in home or office business of your own. Elite Co., 214 Grand St., New York.

ARTIFICIAL Marble sanitary flooring instructions covering wood or cement flooring ½ inch thick, fireproof, all colors, low cost. Ornamental casting, concrete plaster-papier-mache decorations, garden furniture, statuary, flexible molds, particulars and illustrations free. Chris. Maher, Elmont, N. Y.

BARGAINS—Paint spray outfit, gasoline engine driven. Terms—trial. Helmick Paint Spray Exchange, M-233, Troy, Ohio.

FORMULAS AND TRADE SECRETS

ANY Formula 50c! Three \$1.00! Guaranteed!! T-S-G Publ., Box Tep-p, Wilkinsburg, Pa.

FORMULAS, All kinds. Guaranteed. Catalog free. Kemico, 32, Parkridge, Ill.

INVISIBLE INKS (sympathetic). Send 25c for 35 different formulas. Novelco, Box 82, Woodside, N. Y.

100 RELIABLE FORMULAS \$1.00. Guaranteed. Leon F. Bugh, 3233 Country Club, Wichita, Kans.

ANY Formula or process 25c. L. Buchman, 614 E. Jefferson, Syracuse, N. Y.

AMAZING Auto anti-freeze formula 25c. Catalog. Allied Research, 2217 N. Kilbourn, Chicago.

NEWEST Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson, Chemist, BD-4702 No. Racine, Chicago.

TWENTY Latest money-making formulas! 20c brings all! International Agency, 1st-2, Cincinnati.

FORMULAS, Plans, Booklet—25c. National Book Agency, 4837 N. Albany, Chicago.

25 PROFITABLE FORMULAS 25c. Wender Service, 1710 Bathgate Ave., New York.

PAINT And varnish remover, no scraping, non-injurious, inexpensive, formula, dime. August Becker, 22 Hale Avenue, Brooklyn, New York.

ANY Formula 25 cents, expert chemist. Lexico, 835 Lexington, Cincinnati, Ohio.

FORMULAS, Processes; all lines. Individual service by experienced chemist. Clore, Industrial Chemist, Crawfordsville, Ind.

SUCCEED With your products. Make-sell them. Formulas. Processes. Analytical service. Catalog free. B. Thaxby Co., Washington, D. C.

500 FORMULAS 25c; Moneymaking literature free. "Ideal," 178P, Parkridge, Ill.

3,000 FORMULAS, Facts, processes, trade secrets in Dr. Brown's Book of Formulas—580 pages. Price, postpaid \$1.00. Ogilvie Publishing Co., 57 Rose Street, Dept. 27, New York.

FORMULAS, Plans, Ideas, Literature free. Belfort, 4042 N. Keefer, Chicago.

ANYTHING Analyzed. Practical formulas. Free list. Associated Chemists, Indianapolis, Ind.

CHEMISTRY

SEND 10c For complete catalog of chemicals, laboratory equipment, microscopes, and biological stains and reagents. Special 30 day offer to those who send immediately. Winn Co., Dept. MC-1, 124 W. 23 Street, New York.

CHEMISTS' Slide rule, solves equations, shows formulas, molecular weights, solubility of 391 compounds. In use from England to China. Postpaid anywhere, complete instructions, two dollars. MWC Company, 508 Andrus Bldg., Minneapolis, Minn.

CHEMISTRY Magazine—Illustrated. 3 months 25c. 1017 High, Petersburg, Va.

FASCINATING Chemistry magazine contains loads of experiments, news, problems, queries, jokes. 5 cent stamp brings sample. Chicago Press, 164 W. Carroll Ave., Chicago.

15,000 PROFIT Making formulas. Following and many others: Accidents and emergencies, agriculture, alloys and amalgams, artist's materials, beverages, cements, glues, pastes, masticates, bleaching, renovating, coloring metals, dyeing glass, heat treatment of metals, household formulas, ice cream, confectionery, chewing gum, lapidary work, exterminating vermin, lubricants, paints, varnishes, photography, condiments, canning formulas, rubber, soap, candles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. Just write for "Scientific American Encyclopedia of Formulas." When postman hands you book pay \$5.50 and postal charges. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

HANDBOOK For chemical experimenters, revised and illustrated, 50c. Experiment booklet 15c. Chemical catalogue 10c. Scientific booklist free. Reading Scientific Co., Reading, Pa.

CHEMICALS, Laboratory glassware and apparatus. Catalog CP. Biological Supply Co., 1176 Mt. Hope Ave., Rochester, N. Y.

AGENTS WANTED

START The new year right. Get our offer for a real surprise. Best proposition in direct selling. Details free. J. Kennedy Co., Kokomo, Ind.

MEXICAN Feather pictures. Send 25c (stamps) for \$1.00 worth sample and details. Mexican Art, Apartado 1593, Mexico City.

STEADY CASH INCOME—Making sparkling chipped glass name plates, numbers, signs, checkerboards, resilvering mirrors, metal plating, etc. Illustrated booklet free. E. Palmer, Wooster, Ohio.

217% PROFIT With new, scientific cream that mends all cloth easily, quickly, invisibly, without needle and thread. Stands laundering. Free sample. Sew-No-More Co., Dept. F-744, Cincinnati, Ohio.

JUST What you're looking for—a business of your own handling the slickest line of quick-sellers you ever saw. Every one a winner. Take your pick or handle them all. Sell stores, homes, offices. Liberal commissions. By all means investigate. Haddon, "A16," 1837 N. Ogden, Chicago.

CASH Income resilvering mirrors; replating metalware; making glass signs. Portable outfit. Sprinkle, Plater, 128, Marion, Ind.

NEW—Different pinless curtain stretcher—Curtains attached in 30 seconds. Low-priced, 100% profit. Miniature sample furnished. Write Evans Co., Dept. MC-16, Cincinnati, Ohio.

INITIALING Automobiles biggest money maker today. New type requiring no varnish to apply. Write for samples. International Monogram & Transfer Co., Box 6365, Philadelphia, Pa.

AGENTS—Sell new improved staple item to stores. Winter helps. Safe proposition. Write for samples. International Monogram & Transfer Co., Box 6365, Philadelphia, Pa.

SALES KIT free. Write for our free offer and catalog of household deals, cosmetics, extracts, etc. Make big money selling your friends and neighbors. Clyde Collins Chemical Co., Dept. 15A-1, Memphis, Tenn.

A BUSINESS OF YOUR OWN—Making sparkling glass door plates, desk plates, numbers, signs, checkerboards, mirrors. Illustrated book free. Palmer Signs, 512, Wooster, O.

PENNY EACH. Popular sizes. Guaranteed. Window sign letters. Free samples. Atlas Sign Works, 7941 Halsted, Chicago.

MAKE BIG MONEY: commissions advanced; sell raincoats, zipper jackets; union made; latest style; quality; lowest prices; experience unnecessary; outfit free. Goodyear, HT-712 Roosevelt, Chicago.

100% PROFIT In the mystery cigar lighter. No flint or friction. What makes it light? No wind can blow it out. Retails 25c. Sample and sales plan 25c. New Method Company, Desk PM-2, New Method Bldg., Bradford, Pa.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 11A.

NEW Patented device. Washes outside windows from inside. Every housewife prospect. No competition. Real moneymaker. Heller Products, 2350 Seminary, Chicago, Ill.

AGENTS: Make 600% profit selling cleaner, polish, shampoo, vanilla, tonic laxative, spot remover, etc. Your name on labels. Free sample. Standard Chemical, Dept. E-25, Dayton, Ohio.

CACTUS CANDY, a goldmine for agents. Splendid sales. Unusual confection. Send \$25 for sample. Norust Sales, 390 Grand Ave., Rochester, N. Y.

SELLS Like hot cakes. Big profits. New laundry soaps. Perfumes clothes lastingly when washing. Territory given. Sunset Laboratories, Lynbrook, N. Y.

MAKE YOUR OWN PRODUCTS. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1930 W Broad, Richmond, Va.

SEND Hose size for samples and opportunity for \$20 week job. Just show sensational guaranteed hosiery to friends. Dignified, pleasant, easy work. Everything supplied. Wilknit Hosiery, B-37, Greenfield, O.

STRANGE IRONING CORD. Prevents scorching. Saves electricity. Abolishes kinks, snarls. Approved by Good Housekeeping. For telephones also. 140% profit. Samples furnished. Neverknot, Dept. 2-A, 4503 Ravenswood, Chicago.

500% PROFIT Selling new "20-in-1" kitchen utensil. Retails 25c. Costs you \$1.00 a dozen. \$7.20 a gross. Sample 10c. New Method Co., PMM-2, Bradford, Pa.

OVER 100,000 ARTICLES wholesale. Large illustrated wholesale catalogs. Directory 10c. B-Wepeo, 3705 University, Des Moines, Iowa.

AMAZING ZIPPER PINLESS CLOTHESLINE. Instant demonstration. Sure sale every home. Free guarantee sales plan. Dunn Bros., Hempstead, N. Y.

PROFIT With new products. Make, sell, repeat. Guaranteed formulas, special prices, leads. Biggest catalog free. Gibson, Chemist, BD-4702 No. Racine, Chicago.

PORTRAIT Agents throughout the world. Lowest prices, portraits, frames. Catalog free. Picture Man Friedman, 528 Cornelia, Dent. 9, Chicago, Ill.

DISTRIBUTORS: Represent manufacturer. Sell Latex—self sealing bandage that breathes. Great demonstrator. Lowest prices, 400% profit. Good repeater. Exclusive territory. Neway, 24-H South Clinton, Chicago.

78c PROFIT On \$1.00 sale. Martin writes "Have supported my family for the past year selling IMP rings." More than two million sold. IMP rings reduce cost of cooking by gas 25 to 50%. Money back guarantee. Start the New Year with a proven seller. Economy Appliances, 10½ South Canal Street, Chicago.

AMAZING PREMIUM DEALS with new cleaning compound. Sample, details free. Best-ever, 5009-P Irving Park, Chicago.

AGENTS—Sell 5 glasses California orange jelly, 25c. 200% profit. 5 glass sample 25c. Cutler-Clarke, 5515-M Ruthelen, Los Angeles, Calif.

QUALITY FLAVORS, attractive 4-bottle deal; two 4-oz., two 8-oz. Costs you 31½c, distributor's price. Sensational \$1 seller. Favorite, 2100 Kennedy Northeast, Minneapolis, Minn.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfit. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

100 PROFITABLE Mail order and local business plans. A. Pruitt, Elburn, Ill.

DOUBLE-EYED Self-threading needle packages, size 3/9. Blind people thread them. Invaluable for failing sight, necessary for good sight. Sample, particulars 10c. Agents wanted. Wm. Ogleby, Vandalia, Ill.

AGENTS: Smash go prices. Santos coffee 12c lb. 4-oz. vanilla 8½c. \$1.00 size tonic 14c. Razor blades 10 for 8½c. 100 sticks chewing gum 12c. 150 other bargains. Experience unnecessary. Write Carnation Co., PO, St. Louis, Mo.

SUCCEED With your products. Make-sell them. Formulas. Processes. Analytical service. Catalog free. B. Thaxby Co., Washington, D. C.

FOR THE HOLIDAYS—our Luminous Crucifix which "shines in the dark" is the most appropriate gift of all. An instant to demonstrate and the sale is made. Big profits. Hannan Co., 2539 South State, Chicago.

GENUINE GOLD LETTERS for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

MAKE PRODUCTS YOURSELF. Formula catalog free. Kemico, 45, Parkridge, Ill.

REGULAR INCOME; home, office, no canvassing. McArthur Co., Desk 5, Butte, Mont.

FREE LITERATURE describing many money making plans. Belfort, 4042 N. Keefer, Chicago.

BIG MONEY APPLYSING GOLD INITIALS on automobiles. Easiest thing today. No experience needed. Free samples. "Ralco," 1084 Washington, Boston, Mass.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

BIG MONEY AND FAST SALES. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 40, East Orange, N. J.

AGENTS: Opportunity to make money; book containing 87 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

PROFITABLE HOME BUSINESS. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

BE INDEPENDENT. Own your business; experience unnecessary, selling \$10,000 accidental death, \$50 accident; \$25 sick weekly benefits—\$10,000 yearly. Other amounts proportionate. Guaranteed steady renewal income. \$250,000 deposited insurance department. Universal Policy, 716-A LeFevre Bldg., Newark, N. J.

"HOW To Secure Agents," a specially prepared booklet, tells of one of the most inexpensive methods in which to secure good live producing agents. It is free; write for your copy today! F. W. Johnson, Mgr., Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago, Ill.

HIGH-GRADE SALESMEN WANTED

BIG Money opportunity! Permanent. Experience unnecessary. Pay weekly. Year round profits. Fascinating outdoor work. Full or part time. Unlimited field. Complete outfit free. Brown's Nurseries, Dept. 120, Rochester, N. Y.

NEW, Sensational 25c and 35c direct store sellers. No competition. Exclusive territory distributors; also two direct consumer part-time, all-time sellers. Answer stating territory, store or consumer. Magic Kleenway Publishing Company, 508 So. Dearborn, Chicago, 1954 Goodfellow, St. Louis, Mo.

SALESMEN Demonstrators. U-Kan-Plate with pure silver. 1 oz. polish 25c, 8 oz. \$1. Justice, 901 Walnut, Philadelphia.

SALESMEN: Acquainted with garages, filling stations, to handle local business. Write Colgate, 2628 N. Third St., Milwaukee, Wisconsin.

MAKE Big money steady. High grade coveralls, shopcoats, pants, shirts, summer suits. Advertising on back. Fast sellers. Free outfit. Strong Mfg. Co., 901 West Jackson, Dept. N-1, Chicago.

SELL Process engraved printing \$3.95 thousand, with free cut service. Worth \$7.00. Nothing like it! Commission \$1.00. Experience unnecessary. Outfit furnished free. United Engravers, F-8 So. Dearborn, Chicago.

MAN Handle regular store route. Place nationally advertised 5c-10c counter card mugs. New aspirin deal—6 tablets 5c, 85 other fast sellers. 100% profit. No investment. Samples free. World's Products Co., Dept. 2810, Spencer, Ind.

WANTED: County salesman with car, to demonstrate and service for large Ohio manufacturer. First-class job. 243 Fyr-Fyter Co., Dayton, O.

DON'T Be a job hunter—Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average \$3,000 to \$5,000 annual sales year after year. We supply stocks, equipment on credit. Over 200 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world wide industry. Write Rawleigh, Dept. B-U-PPM, Freeport, Illinois.

BIG Money in tire patches. Sell new auto tire patch to service stations, garages, etc. Tiger-Grip patches guaranteed 10,000 miles. \$75 weekly for salesmen or distributors. Protected territory. Write Economy Rubber Co., 735 Burkhardt, Dayton, Ohio.

NEW Refillable punch boards sell wherever demonstrated. Big profit operating or selling outright. Currier Mfg. Co., 314 Terminal, Minneapolis, Minn.

GO Into wholesale business without investment. Call on stores with biggest line self-selling counter displays: Aspirin, razor blades, handkerchiefs, breathlets, household cement, 79 different items. Up to 125% profit for you. Experience unnecessary. Write for catalog and plans. Procopax, Dept. 36-FD, 1958 S. Troy, Chicago.

SELL Neoprint process. No type or engravings needed. Handsome profit. Experience unnecessary. Complete outfit and instructions, dime. August Becker, 22 Hale Avenue, Brooklyn, N. Y.

HERE It Is—\$1.00 makes \$20.00. Representatives, full or spare time. Start own business. Enormous profits. Every one a prospect. Wonderful repeat business. Rush stamp for full details. Marvelous introductory offer. Springfield M. P. Service, 1445 State St., Springfield, Mass.

PENNY Each. Non-tarnishable window sign letters. Free samples. Atlas Sign Works, 7941 Halsted, Chicago.

BIG Money taking orders for new inexpensive drip coffee urn through luncheonettes, sandwich shops, barbecue trade. Makes delicious coffee quickly, economically; increases luncheon profits. Sells for only \$9.00 to \$17.50. Large profits. Write the Kitchen Craft Co., Dept. A-30, West Bend, Wis.

SALESMEN: Sell complete line gummed labels, calendars, memo books, and business stationery. Special features. Free deals. Big commission daily. Attractive sales portfolio free. David Lionel Press, Dept. AG, 312 So. Hamilton, Chicago.

NEW Mechanical wallpaper cleaner. Revolutionary invention. Banishes cleaning drudgery. Homes, offices buy instantly. Hustlers coining money. Outfit free. Kristee Mfg., Box 1432, Akron, Ohio.

SOMETHING New in fire extinguishers. Red Comet automatics. Proved in west five years. Exclusive territory. Low price opens pocketbooks. Write Red Comet, 404 Comet Building, Littleton, Colo.

YEAR'S Income in 3 months! New federal, state and code laws create immense demand for simplified record system every businessman must have to protect himself against fines and penalties. Millions users must buy again now. Our men selling 5 to 25 daily our officially approved, copyrighted Liberty Tax Record, \$3.50 cash profit every sale. Repeat commissions without callbacks. Live leads furnished. Big season now. Choice territories going fast. Commonwealth Publishing Company, 508 So. Dearborn, Chicago.

SALESMEN Wanted—To sell brand new, patented, low-priced, non-competitive article, just being marketed. Salesmen sample 10c. Ideal Company, Racine, Wis.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Foyer cleared \$4920 in three months. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

NEWEST Most amazing deal for stores, shops. Inexpensive. Big business increase or money back. Gold mine for salesmen. Outfit free. Stimulators, 343 Madison, Chicago.

BRAND New grab-bag deal. Going big everywhere—big profits—swift sales—fast repeats. No restrictions. All dealers buy. Act! K&S, 4372 Ravenswood, Chicago.

SALESMEN—Sell collection systems. 400% commission. Sayers Systems, 2801-123 Sheffield, Chicago.

STICK-ON Window sign letters. 500% profit. Free samples. Metallic Co., 438-A N. Clark, Chicago.

SELL Stores or homes—Scissors sharpeners, gas lighters, razor blades, aspirin, breath gum, chewing laxative, adhesive tape, polish, handkerchiefs, polishing cloths, shoe laces, many others. Attractive displays. Catalog free. Superba Co., S-303, Baltimore, Md.

START A business of your own! Become a subscription representative for "Popular Mechanics." No capital required. Liberal commissions. Monthly bonus. Write for details. V. D. Angerman, Circulation Manager, 200 East Ontario Street, Room 235, Chicago.

HELP WANTED

REAL Jobs open—Auto mechanical field, aviation. Earn \$35.00-\$75.00 weekly. 8 weeks' training qualifies you. Write for big opportunity book and special low tuition now. McSweeny Schools, Dept. 10-A-14, Cleveland, Ohio, or Kansas City, Mo.

BIG Profits daily! Cloro-Tabs—concentrated tablet bleaches, cleans, removes stains like magic! Better, cheaper than liquid bleach. Free sample proves need every home, restaurant, etc. Sell direct or through stores. Midland Chemical Company, Dept. B-31, 5 W. Austin, Chicago.

MARRIED Man with spare time to distribute free samples coffee, flavoring, food products and make customers. Must devote at least two hours daily and be satisfied with up to \$3 in an hour. Permanent. Blair, Dept. 31-B, Lynchburg, Va.

LOCAL Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. Progress Tailoring, Dept. P-217, 500 Throop, Chicago.

MAN Wanted—Old established manufacturer will finance responsible men with complete stock guaranteed food products, farm and household necessities. Very pleasant work. Excellent opportunity for good living and extra money to save every week. Pays better than most occupations. O. W. Jack sold \$208. B. M. Anderson \$320 in one week. No slack seasons or layoffs. Experience unnecessary. Write today for No-Investment Offer. McConnon & Company, Room 66BT, Winona, Minn.

EARN Quick cash raising mushrooms in cellar, shed, attic. We buy crops. Guaranteed materials furnished. Easy, odorless method. Book free. United, 3848-E Lincoln Ave., Chicago.

BIG Money growing mushrooms. Cellar, idle places. Supplies furnished. We buy. Free book. Mushroom Growers, CR-433, N. Clark, Chicago.

DISTRIBUTORS — Supply revolutionary corn remedy to stores. New sales plan results in landslide of orders. 150% profit. Write for exclusive franchise. Reliable Specialty Co., Buffalo, N. Y.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 14A.

AGENTS—Mosco corn and calous remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Company, 54 Seale Blg., Rochester, N. Y.

EDUCATIONAL AND INSTRUCTION

BECOME A successful investigator. Experience unnecessary. Work at home or travel. Write today for free publication and particulars. National System, 340-G Electric Building, Omaha, Nebr.

FINGER Print instructor. Kuhne's \$3; Henry's \$2. Outfit \$1; in wooden case \$2. American System, 219-P West 100th St., New York.

LEARN New trades in your spare time. Refrigeration, oil burners, air conditioning servicing. Herkimer Institute, 1819 Broadway, New York.

LEARN Fast and correct figuring. New methods. Frederick A. Smith, 2419 Smalley Court, Chicago.

MEN-Women, 18-50. Start \$105 to \$175 month. U. S. government jobs. Steady work. Experience unnecessary. Many winter examinations expected. Qualify now. Common education sufficient. List positions and full particulars free. Write today sure. Franklin Institute, Dept. M3, Rochester, N. Y.

WANTED—Name of men desiring outdoor government jobs, \$1700-\$2400 year. Write for free details of instructions. Modern Institute, M19, Denver, Colo.

AMBITIOUS? Discouraged? Let personality analysis chart help you. Postpaid 35 cents. Personality Rating Bureau, Hudson, New York.

THE Plot Builder—Endless source of plots. 50c. International Agency, P-2, Cincinnati.

SECRET Service. Valuable information free. International Secret Service Institute, PM-25, Hoboken, N. J.

NEW Writers wanted. We train you to write for newspapers, magazines. Good writers well paid and in demand. No experience necessary. Write today. National Press, 2806 Beverly, Los Angeles, Calif.

GET U. S. government job—start \$105-\$175 month. Men-women, age 18-53. Are you eligible for eligibility test? Get our free questionnaire—find out. No obligation whatever. Instruction Bureau, 101, St. Louis, Missouri.

LEARN Chirology. Complete course by correspondence. Evans Foot Inst., Montgomery, Ala.

HOME Study courses leading to degrees: Arts and sciences, philosophy, education, law, letters, theology, psychology, engineering, chemistry, business and commerce. Many others. McKinley-Roosevelt University, Chicago.

GET Into aviation. Air transport pilots get up to \$7,000 per year; mechanics, \$2,500. Learn at this government approved school. Write for complete information. State age. Lincoln Flying School, 2005 Aircraft Building, Lincoln, Neb.

BECOME A landscape architect. Easy to learn by mail. Wonderful opportunity for money-making. Earn while you learn. Write for free opportunity booklet and details. American Landscape School, 805 Plymouth Bldg., Des Moines, Iowa.

U. S. GOVERNMENT Positions. \$1700-\$1900 and up a year. Let our expert (former government examiner) prepare you for a position in the railway mail service, rural carrier, post office, customs and other branches. Write today for free booklet. Dept. S, Patterson School, Rochester, N. Y.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING AND LABELS

1000 ENVELOPES 6%. Letterheads 8½x11, business cards, \$2.95. Satisfaction guaranteed. Woodprint, Woodstock, Va.

2000 (6%) ENVELOPES. \$4.85—1000, \$2.65. Abbott Press, Oswego, Kans.

1000 CARDS \$1.40. 500 Letterheads, envelopes, billheads, \$1.75. Bradshaw, 3214 Huron, Chicago.

1000 BUSINESS CARDS, card case, \$1.50. Miller, Printer, Ambler, Pa.

5000 ELEGANT Colored envelope slips, \$3.00 prepaid. All printing low prices. Samples. Goodprint, Harrisonburg, Va.

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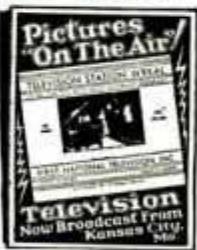
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The NEXT WAR



Aerial View of New York City by Night as It Would Appear to a Bombing Plane Intending to Drop Explosives among the Skyscrapers and Office Buildings

By **GENERAL WILLIAM MITCHELL**

Former Commander Air Forces, A.E.F.

AIRCRAFT can now be built that will go around the world at the equator on one charge of fuel.

Lighter-than-air craft now can be made to carry fifty or sixty tons of useful load besides crew and fuel; they can ascend to 30,000 feet or more, and their radius of

action is greater than that of any other known means of transportation.

Heavier-than-air craft now can be made to go from 6,000 to 8,000 miles, carrying 4,000 pounds of bombs, to operate at an altitude of 35,000 feet, and at a speed between 300 and 400 miles an hour.

But at present we are in a period of arrested development in air power plants

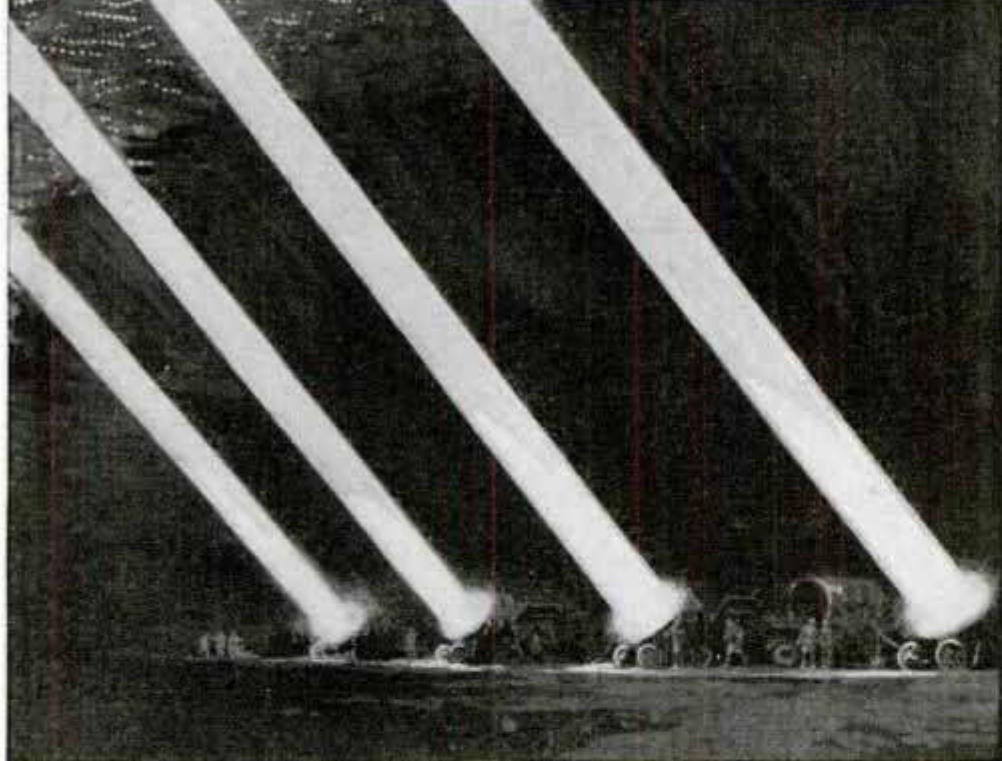
Pictures supplied by John L. Conroy

3/18-19th St. N.C.

D1486

Washington, D. C.

in the AIR



One-Ton Bomb Being Delivered to Bombing Plane and a Battery of High-Powered Anti-Aircraft Searchlights Searching Sky for Planes

because we cannot easily get away from the internal-combustion engine. We are making these bigger and more powerful continually, at present up to about 4,000 horsepower, while our engine fuel is being made safer and more economical. Steam engines and rocket engines are being experimented with, but our greatest aerial development will come with the develop-

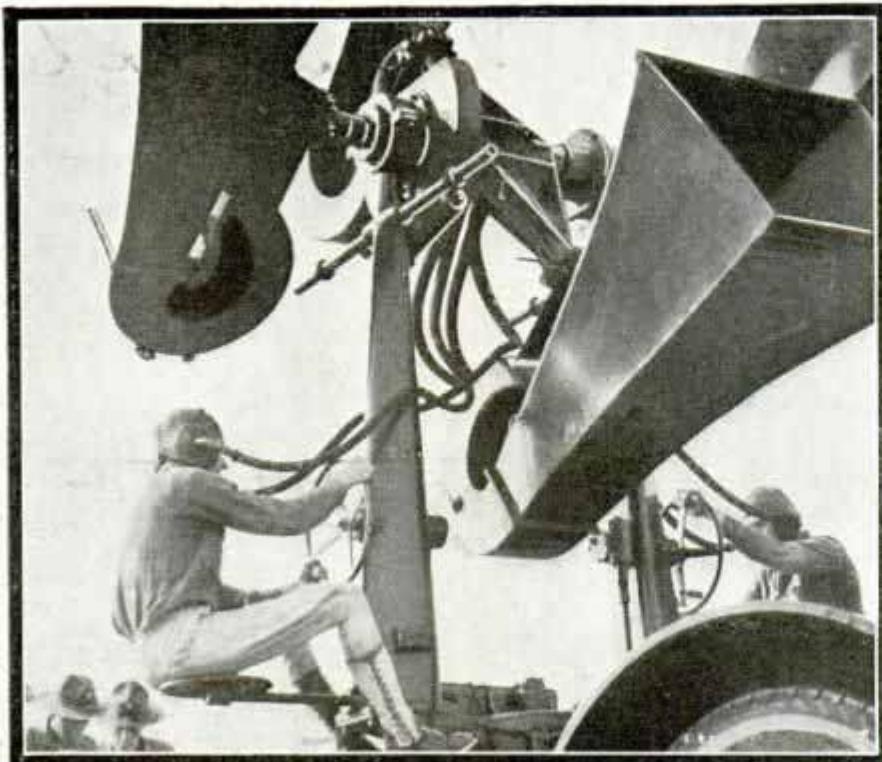
ment of an entirely new type of engine, lighter, stronger, safer and less complicated. The modern gasoline engine has from 2,000 to 5,000 different parts, one of the most complicated mechanisms ever made, not excepting the mechanical toys of the middle ages.

What can air power actually do? We have proved that it is impossible by any known means to prevent aircraft from flying over any point, such as a city or manufacturing area.

Therefore aircraft can go anywhere we wish to put them.

Suppose an enemy air force occupied Kuskokwim Valley, Alaska, and established an air fortress there consisting of a subterranean series of hangars protected against gas attacks.

Auxiliary air fortresses could be placed in two or three other locations. With

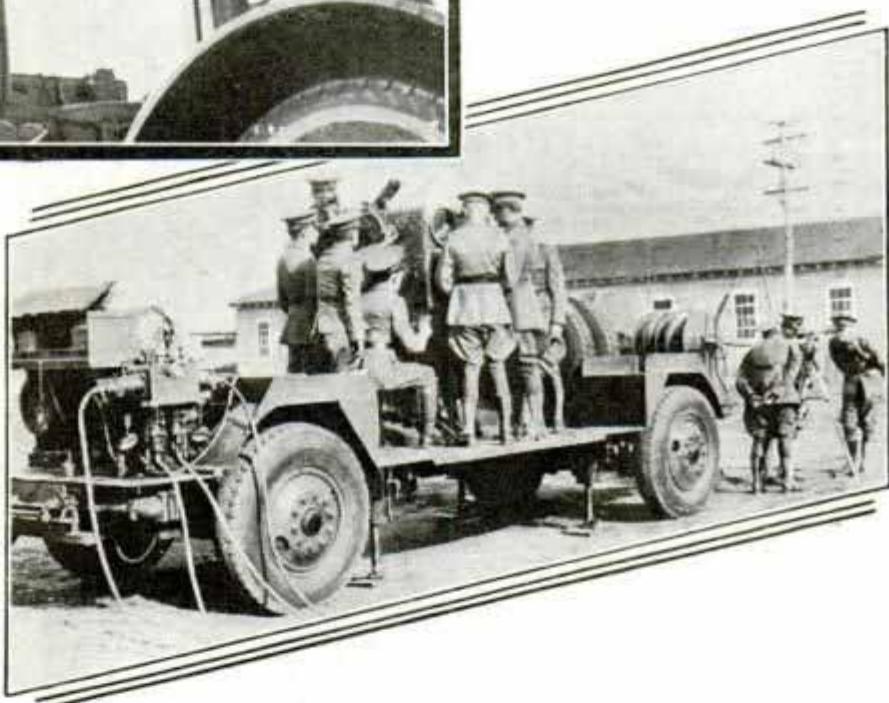


dominance of the air, all shipping will be destroyed by the attacker and it will be impossible to move troops across water areas and probably also across land areas, on account of heavy concentrations of gas.

Now suppose the enemy launches air attacks from his subterranean bases against the triangle New York-Chicago-Washington. Seven transcontinental railroads are put out of business by heavy bombs and concentra-

tions of gas, by the destruction of tunnels, bridges, yards and roadways. Suppose the aqueducts of ten reservoirs feeding the great cities with water are destroyed, and the water supply itself is gassed. Suppose twenty great power plants in this area are smashed or rendered incapable of working. What could the population do? It would not have electric power or water, it would be so curtailed in its transportation as to make it impossible for the people to subsist.

In addition, suppose that the cities themselves are attacked directly by high explosive bombs and gas. We learned in the



Above, Using Sound Locator to Spot Planes; Below, Plane Director Used to Locate Enemy Aircraft, Get Their Range and Angle of Gunfire Necessary to Bring Them Down

ters in history that such an attack would result. High explosive bombs are extremely incendiary. A few well placed would put the city in flames which could not be controlled. A little gas mixed with the high explosive would spread terror and panic among the population. Two or three modern airplanes, attacking each of seven cities in this area nightly, would drive at least 20,000,000 people from their homes.

In all probability, we shall not see the great numbers of airplanes we had in the last war. Now, aerial power will be exerted by air cruisers. They will set out on their missions alone. Their crews will be

last war that it requires comparatively little aerial activity to cause the evacuation of a city. People become terrified even at the sound or appearance of airplanes. In the future they will neither hear nor see them; the first indication of their presence will be the explosion of enormous projectiles and the sprinkling of gas.

Should this occur in a city such as New York, one of the greatest disas-

equipped with high-altitude suits, which carry oxygen on the belts, and chemical means of heating them. Automatic pilots will guide the ships. The course will be checked by radio in a manner which cannot be interfered with by the enemy. It is so difficult to find aircraft in heavy clouds and in the dark, that the menace of opposing aircraft will be almost negligible.

The simplest form of weapon will be the dropped bomb, containing chemical explosive, gas or incendiary compounds. Modern bomb sights are stabilized with gyroscopes and so arranged that the altitude, drift and speed are automatically taken care of on the instrument itself. Aircraft may "stand off" miles from a city and send projectiles into it by air torpedoes, which are



*Anti-Aircraft Battery in Action
and a 2,000-Pound Bomb*

really small airplanes guided by gyros and radio, or by gliding bombs which, when dropped, will attain a speed through force of gravity sufficient to fly them. Gyroscopic control then puts them on their course and they speed straight to their target.

Of the ninety-six aeronautical records held in the world, the United States holds about six. During the last month or so, a Russian has flown 7,700 miles without landing or refueling. An Italian has flown at a speed of 440 miles an hour. An English plane has flown from England to Australia, 11,300 miles, in less than three days, while Kingsford-Smith flies the Pacific, with one jump of well over 3,000 miles, and finds little specks of is-

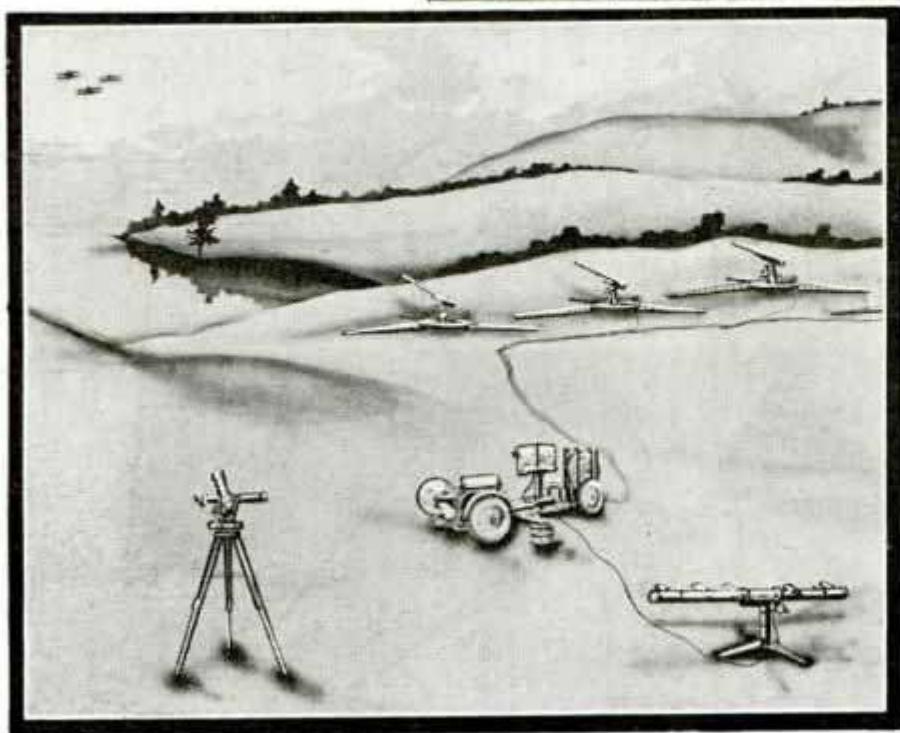
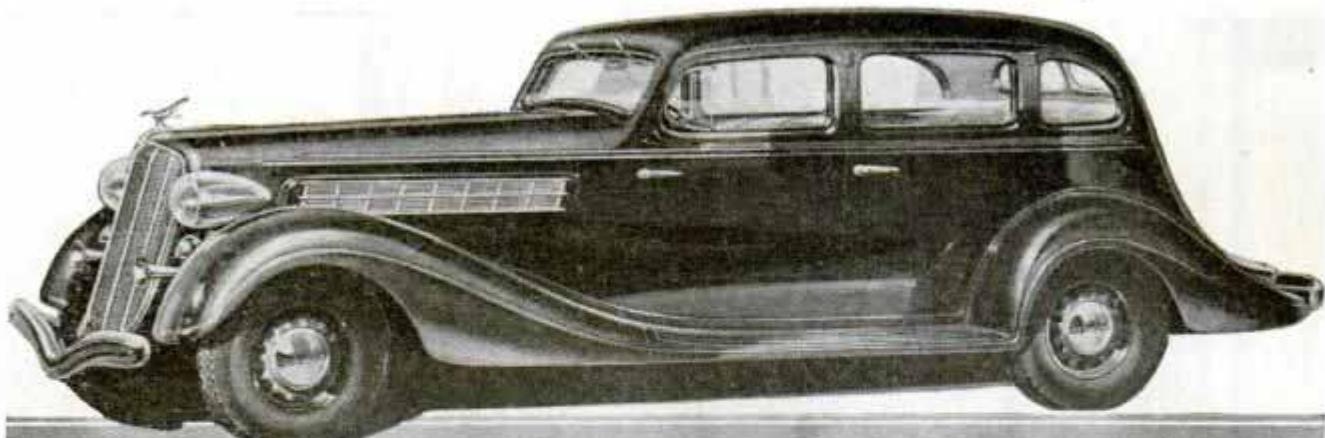


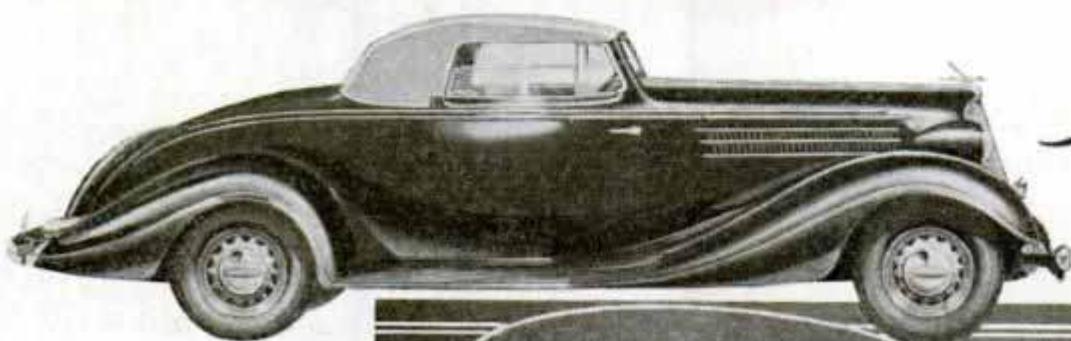
Diagram of Anti-Aircraft Battery in Operation, Showing Director in Center, Commander's Telescope at Left and Height Finder at Right

(Continued to page 135A)

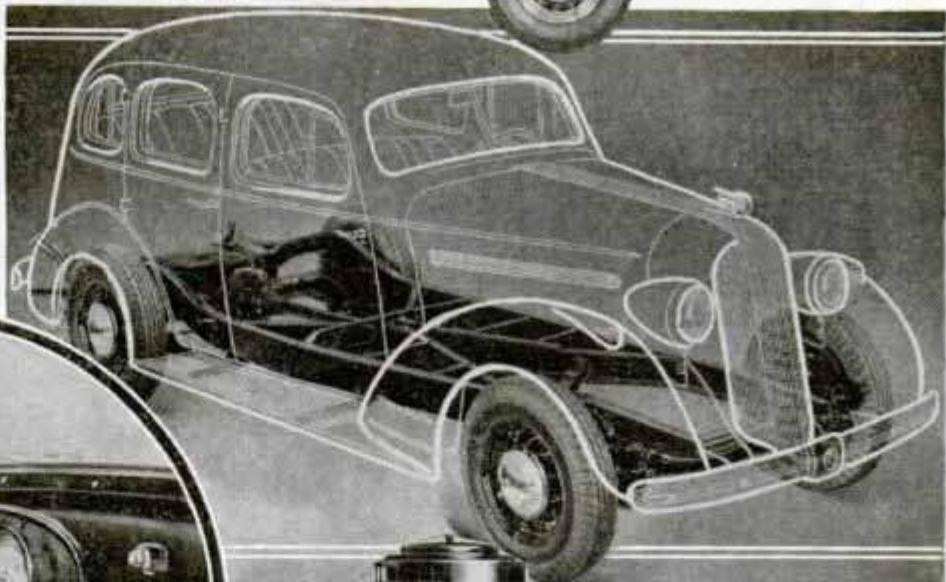
D1551 Leggett



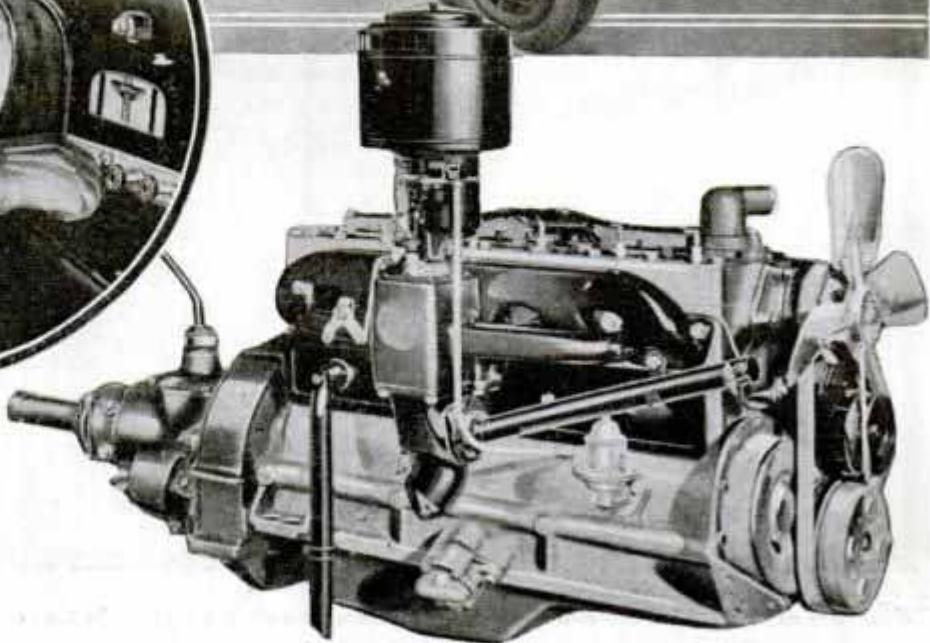
Hudson Sedan on 124-Inch Wheelbase with Eight-Cylinder Engine Developing 113 Horsepower; Hudson Also Offers a "6"; Below, the Terraplane



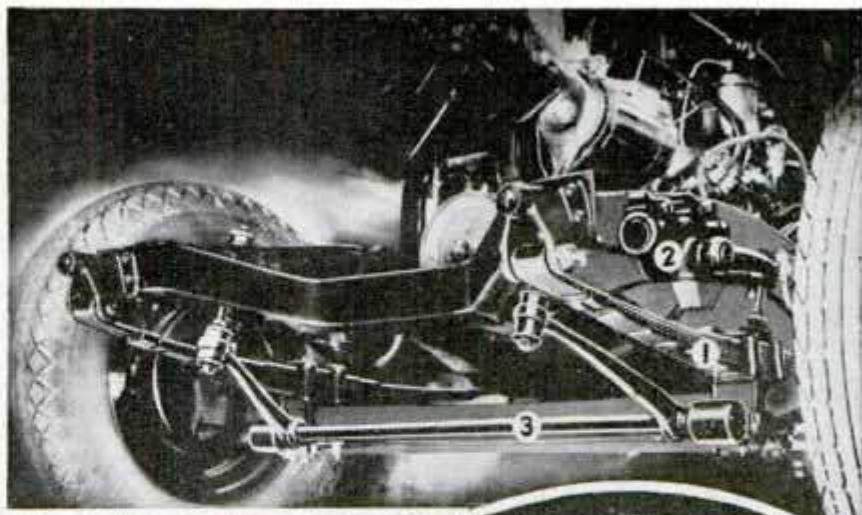
Right, the Pontiac in Outline to Show Powerful Frame on Which Is Mounted All-Steel Body with All-Steel Top; Below, Circle, the Pontiac Dash; Features Include Hydraulic Brakes and an Efficient Lighting System



Right, the Pontiac Six-Cylinder Engine Which Contains Silver Alloy Connecting-Rod Bearings; the Eighty-One Horsepower Engine Produces a Speed of Eighty; Pontiac Also Is Offering an Eight-Cylinder Car



Right, Plymouth's New Springing System Which Is Said to Produce Riding of Unusual Comfort; Figure 1, the Semi-Elliptic Springs, Figure 2, Double-Action Shock Absorbers and Figure 3, the Ride Stabilizer; This System Replaces Suspension of Front Wheels in the Plymouth; the Engine, Part of Which Is Pictured, Features an Air-Cooled Generator, Water Jackets Extending the Full Length of the Cylinder Bores and Calibrated Ignition Which Permits Maximum Spark Advance for Fuel Economy without Acceleration "Ping" or Detonation

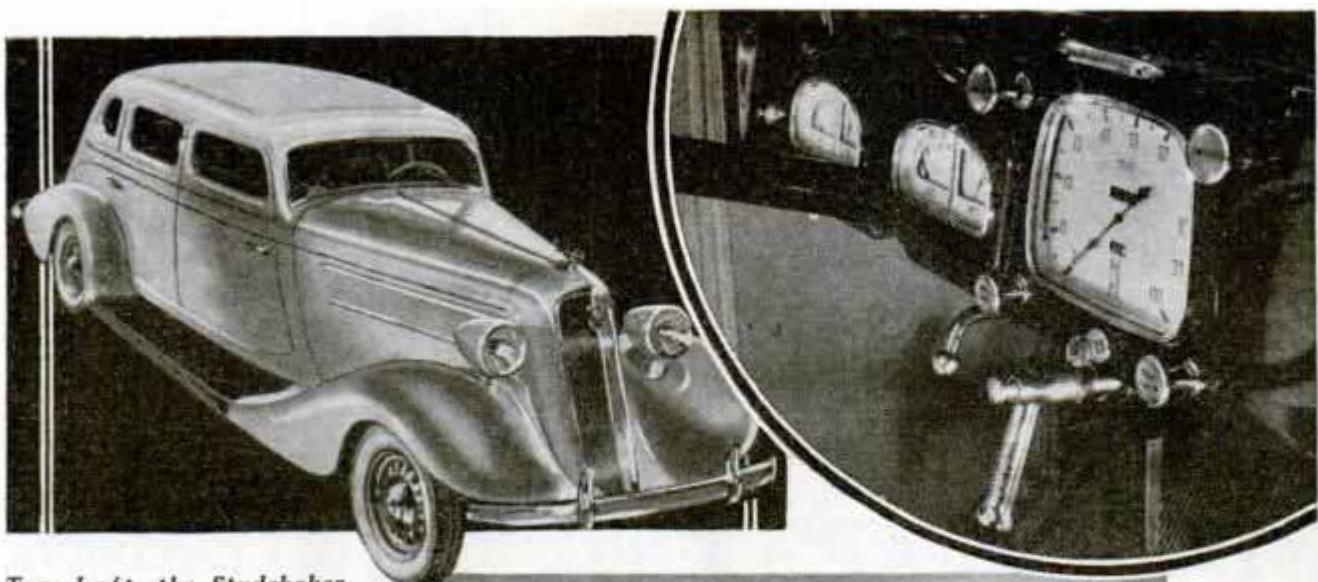


1935 CARS

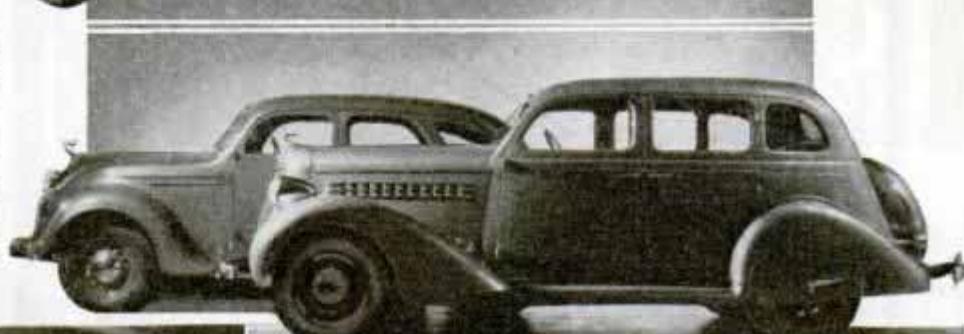
Right, Head-On View of the New Plymouth; Note the Massive Radiator Shell, the New Style Head Lamps and the Unusual Fender Treatment; the Design Marks Another Advance toward the Ultimate in Streamlining; Adjustment of Tappets Is Made Easy by an Arrangement Whereby the Wheel and a Cover Plate Are Removed to Reach That Part of the Engine; Some Features of the Plymouth Engine Are "Floating Power" Mountings, Aluminum Alloy Pistons, Removable Connecting-Rod Bearings and Valve Seat Inserts; the Car Has a Four-Bearing Crankshaft and Roller-Bearing Universals



Side View of the Plymouth; Note the Attractive Treatment of the Hood; Ventilating Louvers Are under the Fenders; One Feature Is New Body Construction Which Brings the Car Floor Closer to the Running Board, Making the Step-Up Short and Giving More Height Inside; a Simplified Ventilation System Permits Movement of Window Glass, But Eliminates Obstructions; the "Cove Ceiling" Eliminates Seams and Braiding on Interior Trim, Resulting in a Smart Appearance; Features from Last Year Include Hydraulic Brakes with Centrifuse Brake Drums and All-Steel Body



Top, Left, the Studebaker with a New Wheel Suspension That Improves Riding Qualities, Compound Hydraulic Brakes and Attractive Body Lines; Top, Right, Dash of New "Airflow" DeSoto; Right, Below, "Airflow" DeSoto and "Airstream" DeSoto; the Latter, a New Product, Has Front-Wheel Suspension



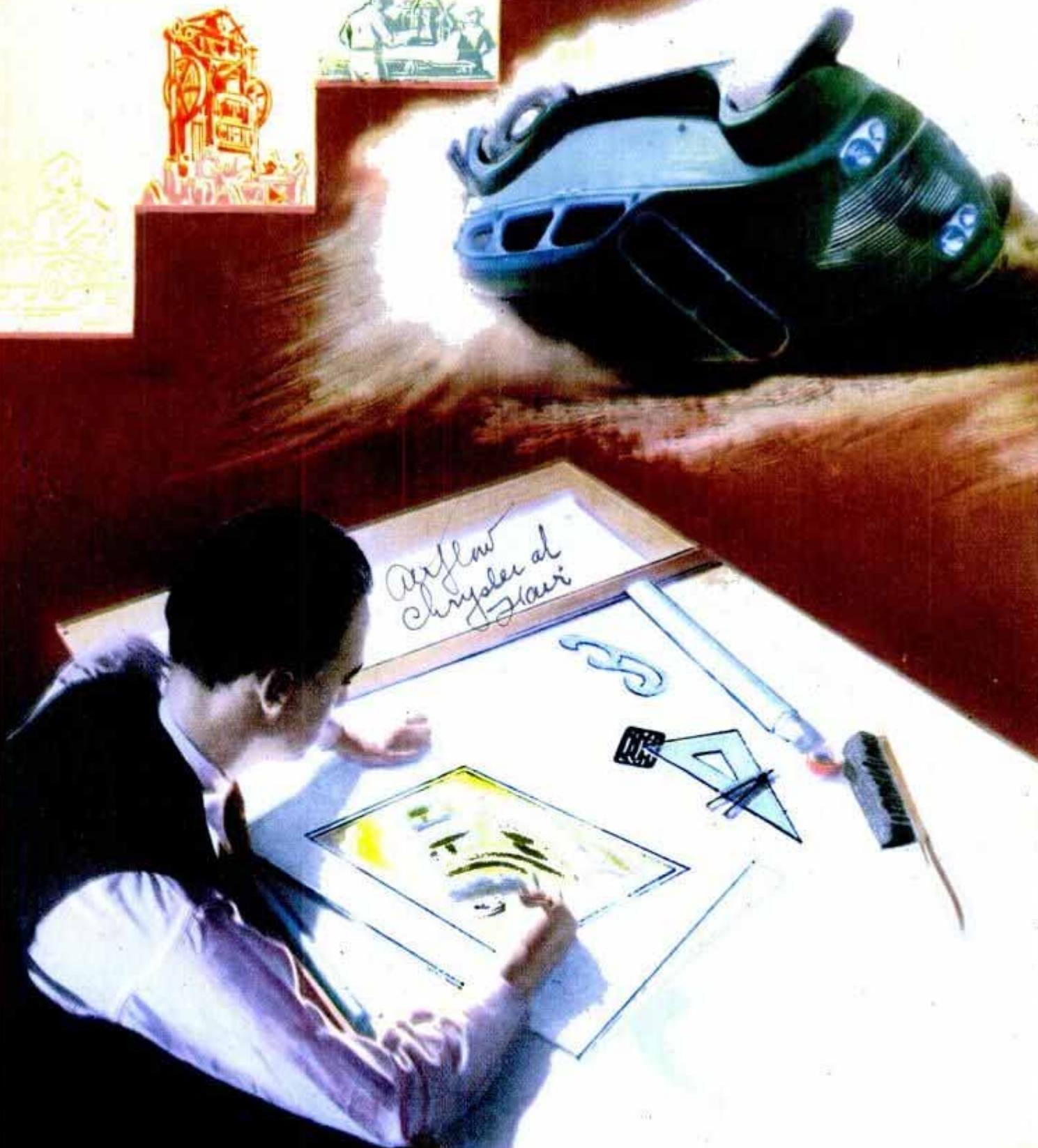
Left, Studebaker Instrument Panel; Note Phantom Type Steering Wheel and Black and Chrome Treatment of Dash; Free Wheeling, Automatic Switch Starting and a "Super-Range" Drive Are Offered on Some Models; the Drive Device Permits Top Speeds at Greatly Reduced Engine Speeds



Above, the Dodge Sedan, Which Improves Riding Qualities with New Front-End Suspension and Redistribution of Weight; Left, Latest Oldsmobile, Which Has All-Steel Body, Hydraulic Brakes and Oil-Distributing System with Drilled Passages That Replace Oil Pipes; Oil System Is Cast with Cylinder Block, and Water Passage Is Cast Integral with the Block

From DRAWING BOARD *to* PROVING GROUND

Earl M. Fueky
Peter Plymouth
Stout Driver



Reflex
Chrysler al
stair

D1271

LEFT, here we see the automobile in miniature as designers and engineers seek to determine the effect of air currents on its shape; the model is shown in a wind tunnel through which the air is forced at high speed.—Courtesy DeSoto Motor Corporation.



WHEN a "flock of geese" turned out to be a fleet of airplanes, an idea was born in the mind of an engineer. And that idea led to the development of an entirely new design for automobiles.

Ever alert for ideas that may result in a more efficient motor, a better brake or a safer steering system, the engineer usually is the first to catch a vision of what is to come. Then, from its conception in the engineer's brain, every new car and every part in it traces a trail of trial and error over the drafting board, through wind tunnel and precision tests, to the proving ground and finally into actual production.

The "wild goose" incident occurred in 1927 as Carl Breer, Chrysler Corporation engineer, drove along a Michigan highway. The fact that he had mistaken the planes for geese started the engineer to thinking about aero-

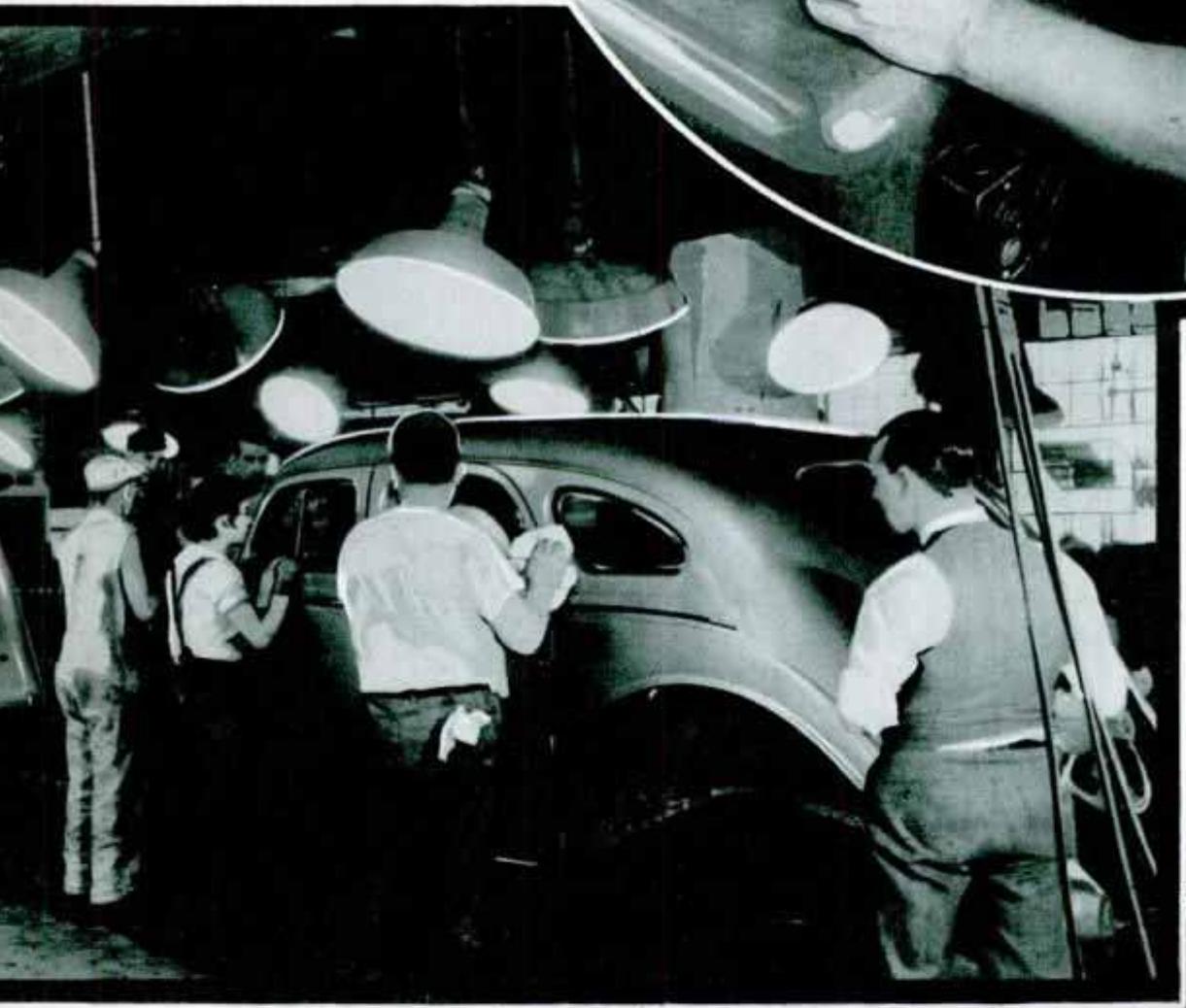


dynamics. He looked at his boxlike car of that year and saw, not the automobile he was driving, but a motor car built like an airplane to move through the air with a minimum of wind resistance.

Impressed by his vision, the engineer tried a simple experiment. He thrust his hand out of the window of his car, palm to the wind. The wind snapped his arm back. But when he turned the side of his hand to the wind, the air currents

D12
Chrysler

RIGHT, aluminum pistons are checked for weight and balance against a master piston; each must be within one-fourteenth of an ounce of master piston's weight; this is one of the precision tests to which parts are subjected before going into modern cars.



ABOVE, all-steel bodies going down the line for buffing and polishing; right, model of the DeSoto framework, showing a resemblance to a bridge; this construction is said to increase passenger safety.



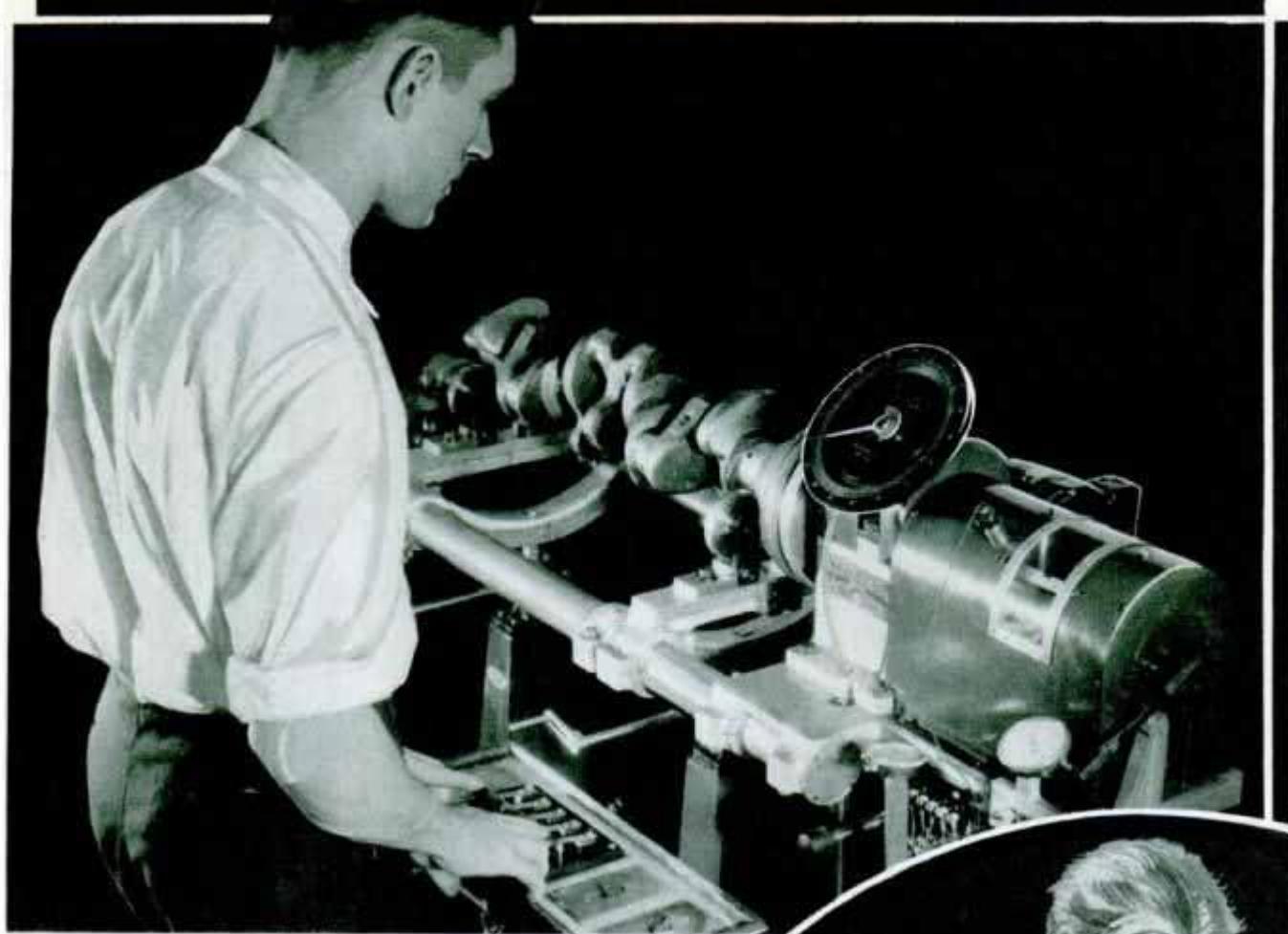




CIRCLE, left, preparing display board for foreign dealers; below, white-hot metal that will be forged into parts for cars; circle, right, shaping model of new car in wax.—Courtesy DeSoto Motor Corporation.

flowed smoothly around it. Breer took his lesson from the "geese" back to the engineering laboratories and just seven years later, an automobile of "airflow" design was introduced to the world.

When an engineer catches such a vision, he takes his problems of design to a corps of draftsmen. Every automobile company employs a number of skilled men who draw hundreds of sketches of new cars and parts as the next year's model is prepared. The draftsmen are always working on new ideas and usually they are years ahead of the other factors that enter into the "birth" of a new car. Executive engineers follow closely the work



Olsen
ABOVE, crankshaft being tested on balancing machine; it is possible to determine exact spot where there is superfluous weight; chart shows amount of metal to be removed for correct balance.

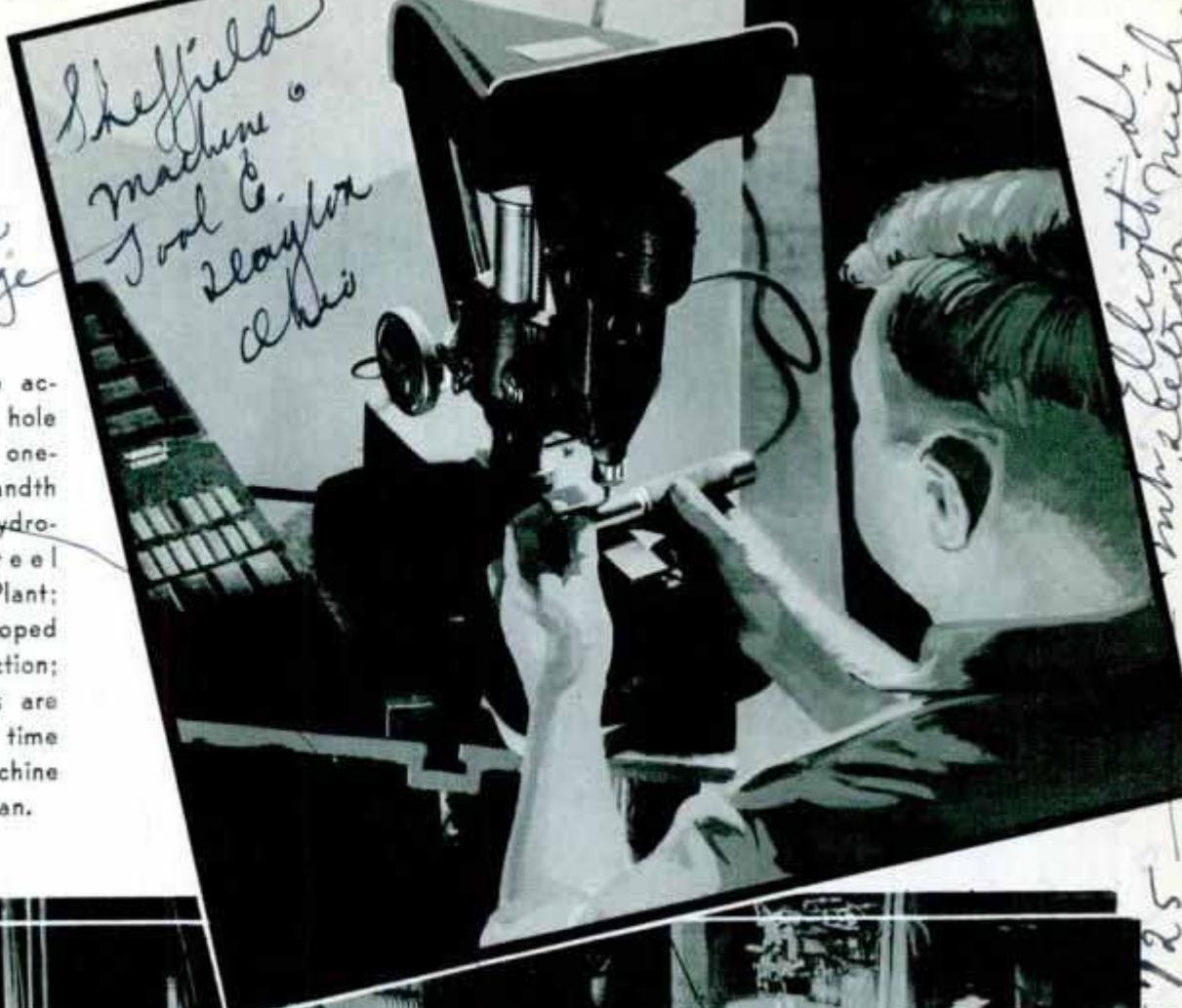


Olyeler

RIGHT, exact balance is important throughout the car, even down to wheel and tire; here we see test in which wheel is balanced by attaching small weights to rim at points marked.

*Sheffield
Master
Comparator
Gauge*

RIGHT, checking the accuracy of piston pin hole plug gauge to within one-half of one ten-thousandth of an inch; below, hydro-matic welding of steel bodies in Chrysler Plant; this process was developed to speed up production; more than fifty spots are welded at the same time by this automatic machine that is almost human.

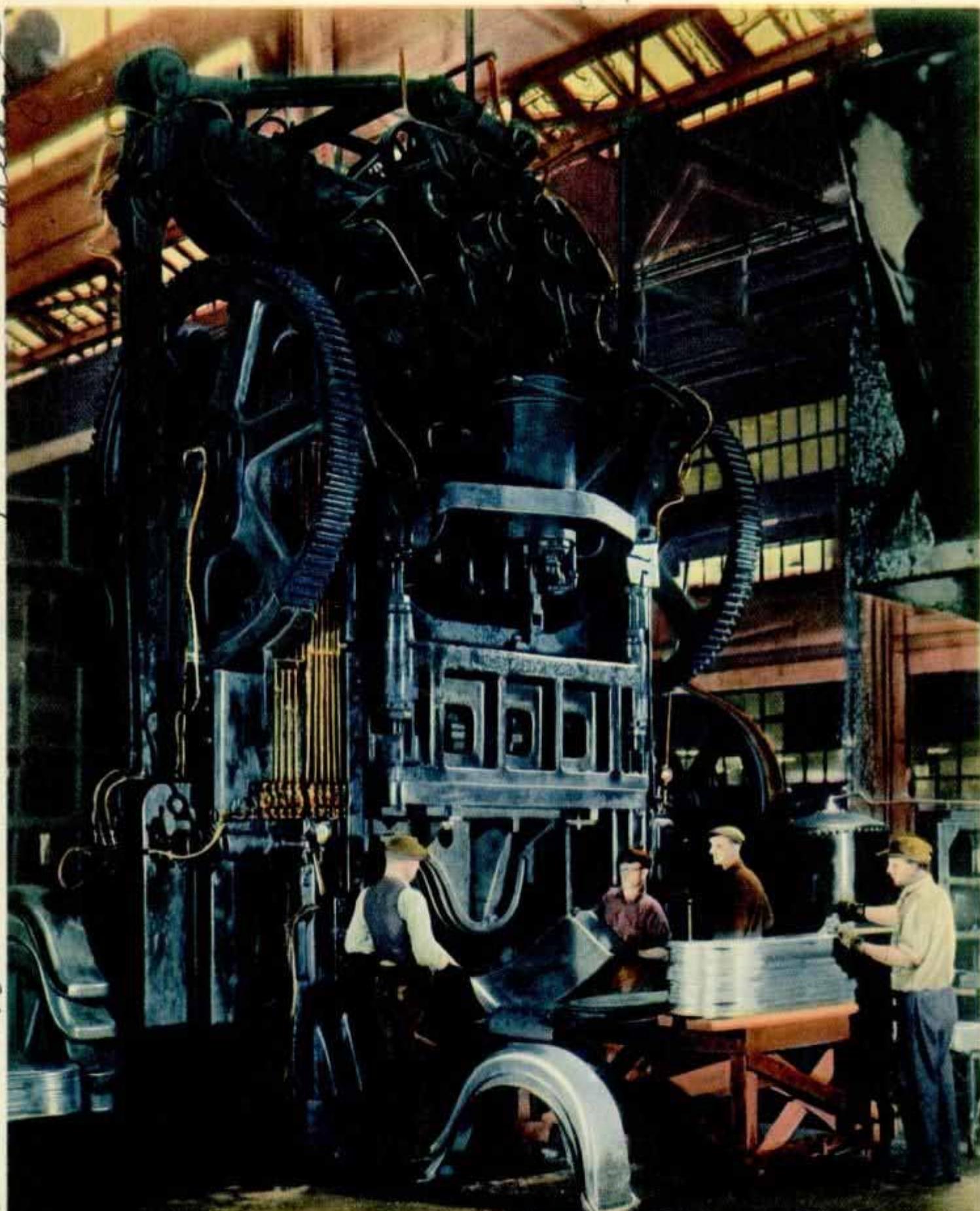


of the draftsmen. When a designer has completed a particular assignment, clay and wax sculptors mold tiny models according to specifications of the approved drawings.

From the sculptors, the models go to small wind tunnels and other testing de-

vices. While its creators carefully check the results, each tiny car is subjected to the wind tunnel test to determine how it resists air currents. If the test is satisfactory, with wind resistance low, the models are turned over to other engineers who work out (*Continued to page 116A*)

2/27/71
Hewitt - Fioite Bros. Isoland Machine Co., 5301 Alisterne Blvd.



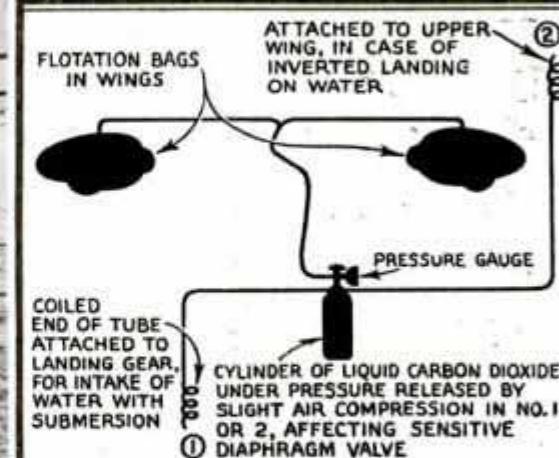
HERE is one of the automobile industry's giant machines, a fender press that shapes metal at high speed; from here the fenders move to the assembly line.

Bags Inflate to Save Land Plane on Water



Left, Bags under Wing Beginning to Fill with Gas; Right, How System Works; Bottom, Bags Supporting Plane and Pilot

Land planes forced down on water can be supported for an indefinite period by two rubberized bags inflated with carbon dioxide. The system is automatic. A tube, open at one end and running from a liquid carbon-dioxide cylinder to the landing gear, fills with water as the plane settles in the water. This compresses air in the tube, causing a sensitive diaphragm to release the carbon dioxide from the cylinder into the bags as a gas. As the carbon dioxide turns into gas, it expands 500 times, filling one bag in each of the upper

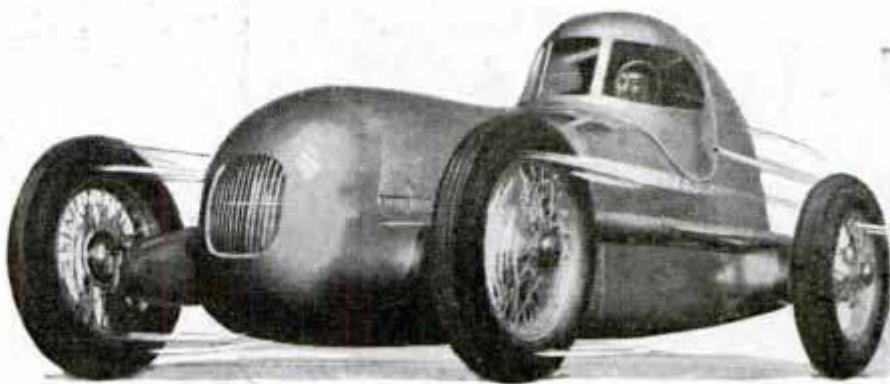


wings of the plane. The first rush of gas fills the bags partially, forcing open the trap doors inclosing the bags in the wings. The bags drop down and inflation is completed, giving a buoyancy that supports the plane. The system, which may be operated manually, works even if the plane lands upside down.

D 1446 Super-Racing Auto Exceeds Three Miles per Minute

Speeds in excess of three miles per minute have been attained by a Mercedes-Benz auto equipped with a special body and racing equipment. On the race course at Budapest, Hungary, the car reached a speed of 320 kilometers per hour (slightly more than 198 miles per hour), a record for that type car. Except for the driving compartment, the body somewhat resembles a cigar. The nose is rounded and the engine hood extends back to the cover over the driver's seat.

This cover, protecting driver and mechanic from the rush of the wind at high speed, rises sharply above the rest of the body, but is rounded to reduce wind resistance.

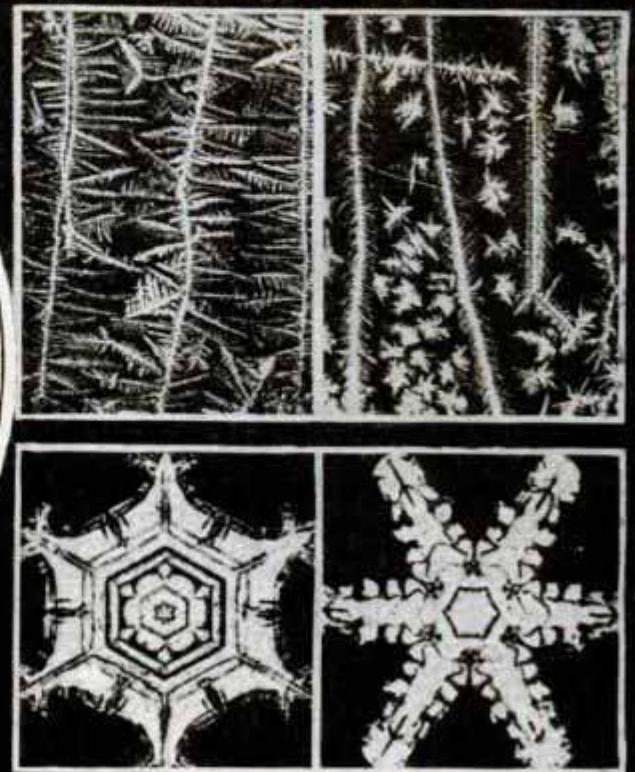


Note Odd Appearance of Driving Compartment in This Racer; Driver Is Fully Protected from Rush of Wind by Dome-Shaped Cover

German race Caracciola.

D1286 Cont. C. G. Talmair
c/o The Pictogram Co.
Box 682 Washington, DC

Exploring the MYSTERIES



ICE is one of the earth's most remarkable substances. It assumes so many shapes and does so many strange things that its study forms a vast and complex branch of science, known as "glaciology." Snow, for instance, is only ice in a particular form.

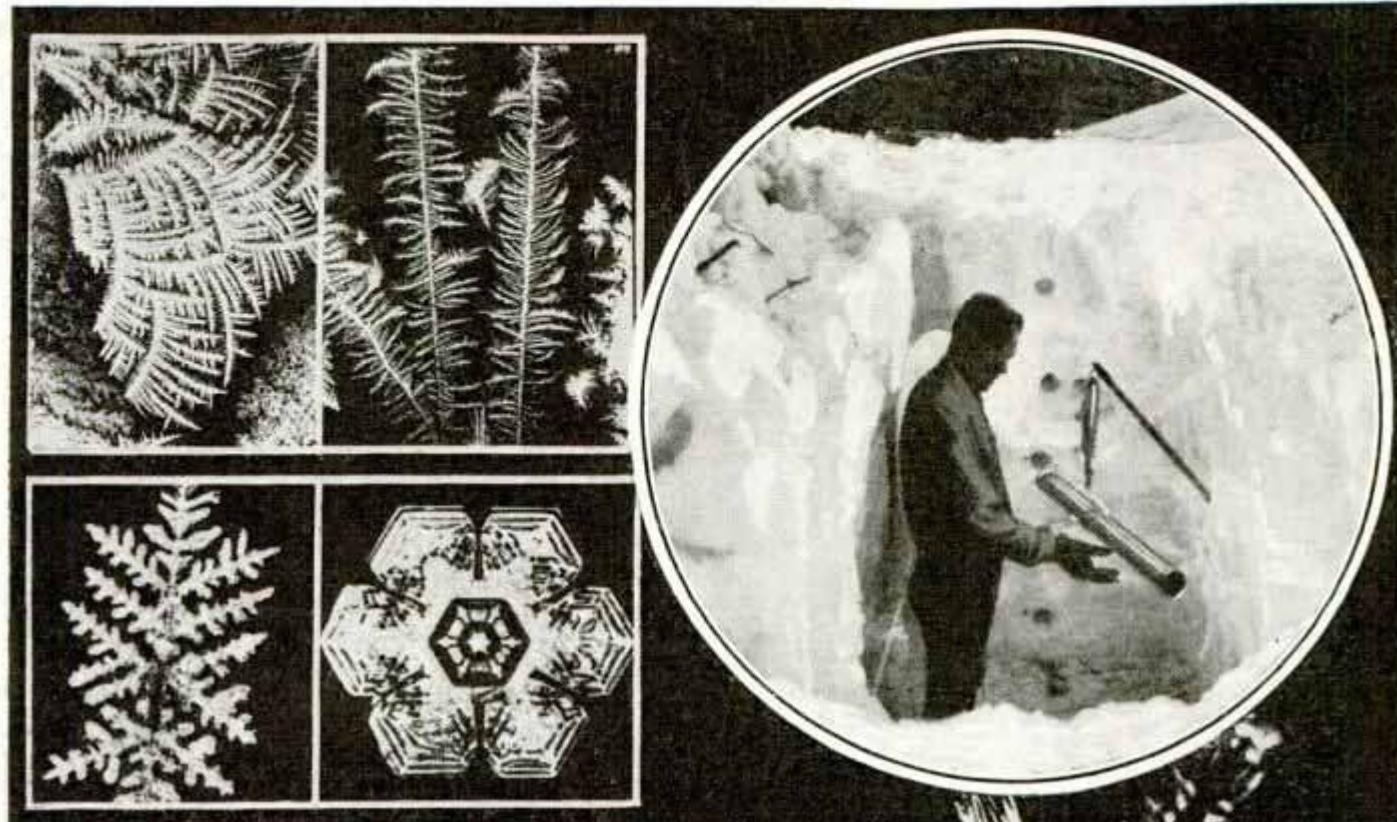
Much information has been obtained in connection with snow surveys. These are conducted in many mountainous regions of the United States and Canada for the practical purpose of predicting each spring how much water from the melting snows will be available the following summer for use in irrigation and power production.

The International Ice Patrol, maintained by the U. S. Coast Guard for the protection of shipping on the north Atlantic from icebergs, was the starting point of a long series of scientific investigations concerning the formation and properties of sea ice in general. The art of "ice engineering," which includes such undertakings as the operation of ice-breakers, the destruction of ice jams, the protection of aircraft from ice deposits and the prevention of ice troubles at wa-

Snowflake Photos Courtesy Publishers Photo Service

Top, Microphotographs of Snow Crystals Made by Wilson A. Bentley; Below, Snowflakes Enlarged 400 Times

of ICE and SNOW

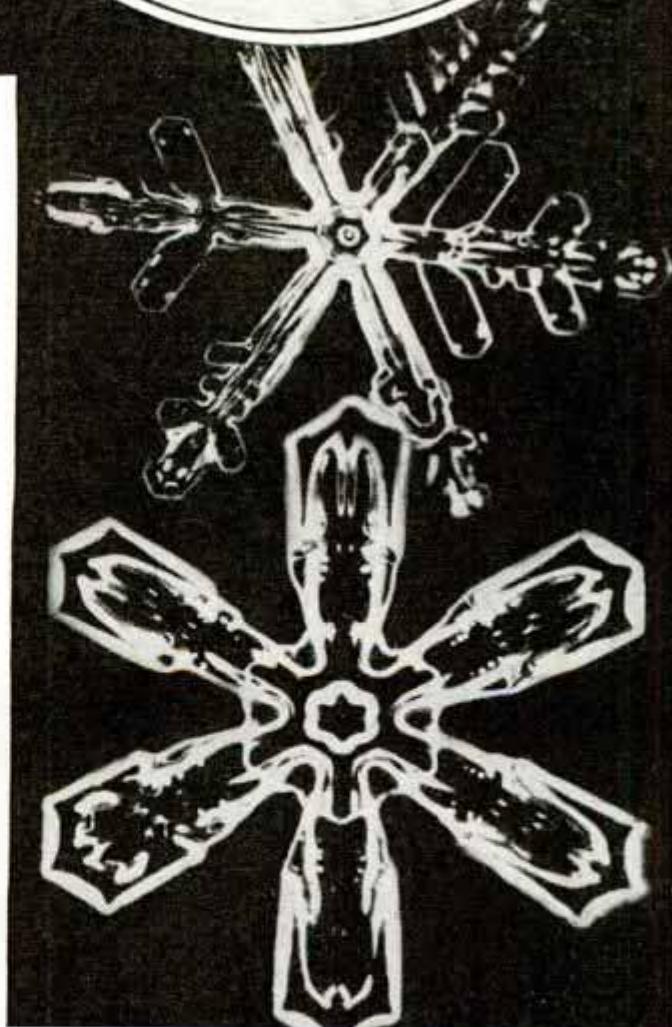


terworks, has led to much research on the physics of ice.

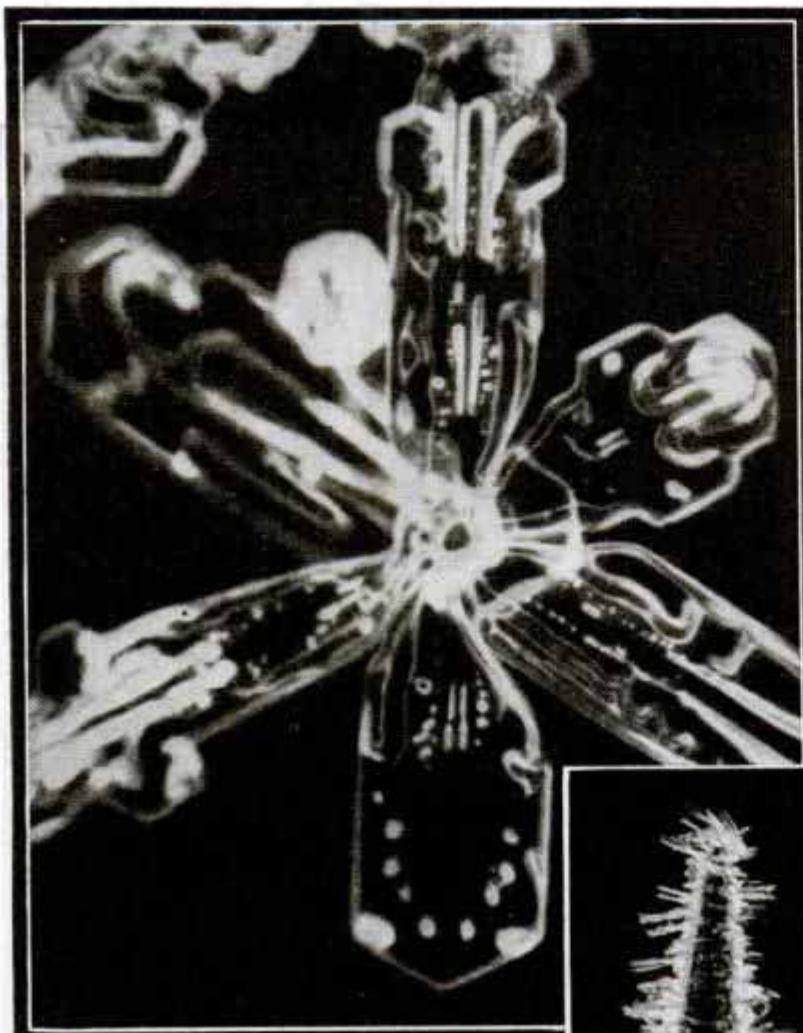
The microscopic study of ice crystals is not new but the wealth of information we now possess is mainly a product of the twentieth century. The ice crystal is one of nature's outstanding mysteries. All crystallization is mysterious, but the case of ice is the most remarkable because its crystals assume a far greater variety of forms than do those of any other substance.

The greatest diversity of shapes is not found in the crystals formed in water or on the surfaces of terrestrial objects, but in those that float in the air as clouds or fog and that fall—either separately or clustered in flakes—as snow. These atmospheric crystals are mostly formed by the direct condensation of water vapor without passing through the liquid stage, though some are built around frozen water droplets, and many are seen under the microscope to be studded with granules of ice that evidently formed from liquid water.

Little is known about the circumstances that determine the pattern of an ice cry-



Above, Obtaining Sample in a Snow Survey; Below, 400-Diameter Enlargement of Snowflakes Showing the Geometric Formations

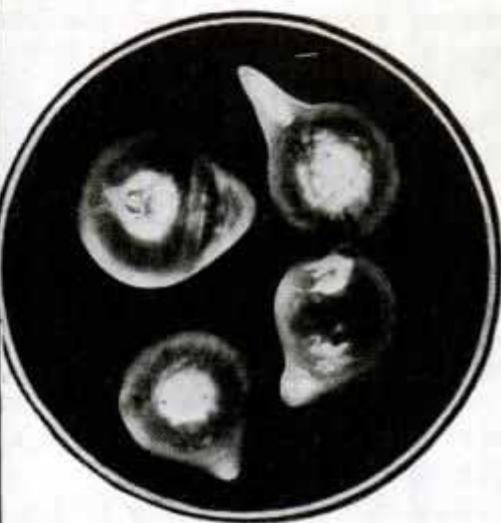
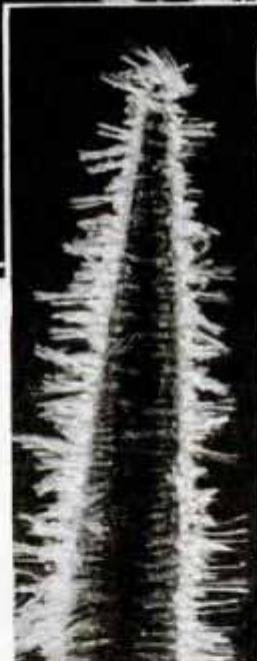


tal. Of the crystals that originate in the free air, the simpler kinds occur in greatest abundance at high levels, where the air is very cold and contains little water vapor. They float in the lofty cirrus and cirrostratus clouds, and in our latitudes often fall as fine and scanty snow in the rear of a passing storm area. The more complex crystals occur in warmer and more humid air. They abound in the low clouds of winter skies and fall in the heavy snows at the front of a storm.

The more elaborate patterns probably start with simple forms and are gradually built up. In the polar regions it is not uncommon for the air to be filled with tiny particles of ice known as "diamond dust." These particles glitter in the sunshine, though they are usually too small to be visible individually to the naked eye. Under the microscope they are found to be simple hexagonal plates of ice without

branches. They probably originate near the ground and are snow crystals in an early stage of formation.

The simpler forms of atmospheric ice crystal produce halos around the sun and moon, and of the many varieties of halo, several depend for their occurrence upon the presence in the clouds of particular types of crystal. Why a majority of crystals in the clouds should thus assume a certain shape at a certain time is unknown. Pos-



Hoarfrost Crystals on Blade of Grass, Frozen Raindrops, or Grains of Sleet, and the First Stage in Crystallization of a Snowflake



Ice Fringes on Stems of Dittany Plant; They Are Formed from Water Rising from Soil inside the Stems and Not from the Condensation of Atmospheric Moisture

sibly it is due in some cases to the presence in the air of a particular kind of impurity, for we know that foreign substances often have a marked effect on the patterns of crystallization found in various minerals.

Hoarfrost, deposited on outdoor objects chilled by radiation to the sky on clear nights, consists in some cases of tiny spherical grains resulting from the freezing of dewdrops, but more commonly of crystals congealed directly from the invisible water vapor in the air. The crystalline forms are quite varied, and, as in the case of snow and cloud crystals, different types are produced under different conditions of temperature and humidity. Hexagonal tubes with bristly tips are often found on frost-nipped vegetation in early autumn and late spring. Another interesting variety resembles a tiny wine glass mounted on a slender stem.

The winter tracery of window-panes has a number of characteristic forms. Window frost tends to form along scratches on the glass, including the invisible curved grooves left on the pane by the ordinary process of cleaning. The icy deposit called "rime" is a product of foggy weather. The water droplets of a fog may remain liquid at a temperature well below the freezing point, but when, in this "undercooled" state, they drift against a solid obstacle, they at once change to ice. On mountain tops enormous masses of rime are deposited by drifting fogs and clouds, giving fantastic shapes to everything that stands upright in the path of the wind. A common kind of rime consists of long feather-like masses of crystals, which grow out rapidly to windward until they become so heavy they break off. Rime feathers that are more than five feet long have been observed to form in a single storm on Mount Washington.

A method has been devised for watching the development of ice crystals in a mixture of warm and cold air. An older laboratory experiment consists of passing a beam of light through a slab of ice and projecting on a screen the images of the starry "ice-flowers" thus revealed. Each of these is a water-filled space, retaining the outlines of a melted crystal. Far beyond the range of the microscope, the

(Continued to page 124A)

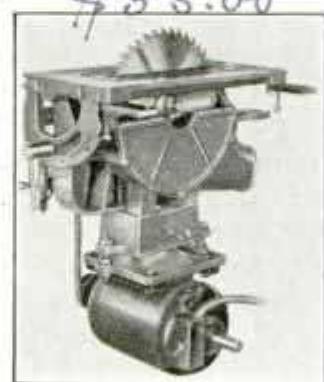


© Publishers Photo Service
Government Chemist Who Cries at His Work, Which Is Testing Samples of Tear Gas

TESTER OF TEAR GAS SAMPLES CRIES WHILE HE WORKS

In order to do his work, a federal laboratory chemist in Pittsburgh is forced to cry every day. He tests samples of tear gas before the shipments are sent to banks and law-enforcement agencies. Although he has been gassed hundreds of times he has suffered no permanent injuries.

RETRACTABLE SAW UNIT TILTS FOR WORK AT ANGLES



Designed for working at angles, a new bench saw can be tilted, permitting every ounce of power to be used. In addition, the saw blade can be lowered, clearing the table top for other work. It is possible with this saw to cut strips of wood barely thicker than paper.

Walker Turner Coe
181

D 1474
Chemical Laboratories of the Federal Government.

1975 November

Pasadena Calif.

More Honey Produced by "Stingless" Bees



Handling the Good-Natured Bees Which Do Not Sting Unless They Are Being Injured, and Weighing a Hive to Determine Amount of Honey Produced in Twenty-Four Hours

Stingless bees now working on California farms are producing more honey than the short-tempered common honey bees. A strain of mild-tempered bees was found in the Caucasus mountains of Asia and taken to Russia where they were crossed with the quick-tempered Italian bees to produce a strain that is not only sturdy and disease-resisting, but so gentle that the bees will sting only if injured. It is claimed anyone can pick up a hive of these good-natured bees and allow the

ian strain. The resulting bees can be handled easily without the aid of smoke, nets or gloves.

D1500

THIRTY-FIVE TON PROPELLERS MOVED BY TOUCH OF FINGER

So delicately balanced are the huge propellers of Great Britain's latest super-liner, the "Queen Mary," that even the touch of a finger on the giant blades is enough to set them in motion. Each of the

four propellers weighs thirty-five tons and they represent the largest manganese bronze units ever cast. In the rough state, the weight of each casting was about fifty-five tons, of which forty-eight tons was in the main pour, from two ladles, the balance being added as feeding metal at intervals to make good the liquid shrinkage. The construction and assembly of the molds, and the melting, casting and cooling the metal required several weeks of work after which several more weeks were spent in machining, dressing and polishing the propellers and in the process of static balancing.

D 14 33
**PORTABLE POWER SAW
HAS SAFEGUARDS**

Weighing only twelve pounds, the latest six-inch power saw is equipped with safety guards. The blade is guarded automatically in every position and there is a safety guard control for pocket cutting. The saw has finger tip depth and angle adjustment and may be tilted to a forty-five degree angle. The blade may be changed without removing the frame or guard. A special universal motor, developing one-half horsepower at idle speed of 5,000 revolutions per minute, gives the saw a cutting speed of 4,000 revolutions per minute. A standard six-inch blade is used. The saw handles materials up to one and seven-eighths inches thick. With proper abrasive wheels, stone, marble, slate and composite materials may be cut.



D 14 17
**OLD BRICK WALLS DUPLICATED
WITH CONCRETE BLOCKS**

Interlocking cast concrete blocks are being used to make walls to resemble the old brick walls such as were popular in New England a century ago. Each block



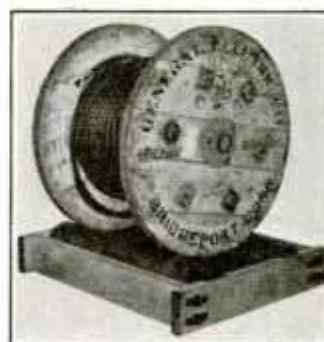
Interlocking Concrete Blocks Cast to Resemble Old Brick and Used in Imitating Old Walls

represents six layers of brickwork, the interlocking joints being cemented in such a way that the wall appears to be made up of individual brick. A wash is applied to the whole to give the effect of great age.

D 14 38

**DOLLY FOR CABLE REEL SAVES
BOTH TIME AND LABOR**

Heavy electric cable reels can be handled without jacking them up or carrying frames for unwinding by employing a reel dolly recently developed. It consists of a horizontal frame which rests on the ground and which contains two steel rollers mounted on ball bearings to support the reel and permit it to revolve.



D 1317

National Broadcasting Co.

30 Rockefeller Plaza

"PROPS" of the RADIO

New York



Stoopnagle and Budd Broadcast; White Sheet at Top Gives Thunder Effects; Note Wash tub at Right; Gas Organ, Extreme Right, Introduces Program

Cont. Mrs. A. J. White, A. 708 One New York Avenue, D. C.
CHILDREN'S hour on the radio brings a fairy tale in which a horse climbs a glass mountain. Distinctly the listener-in hears the scrape of the horse's hoofs and the tinkle of breaking glass.

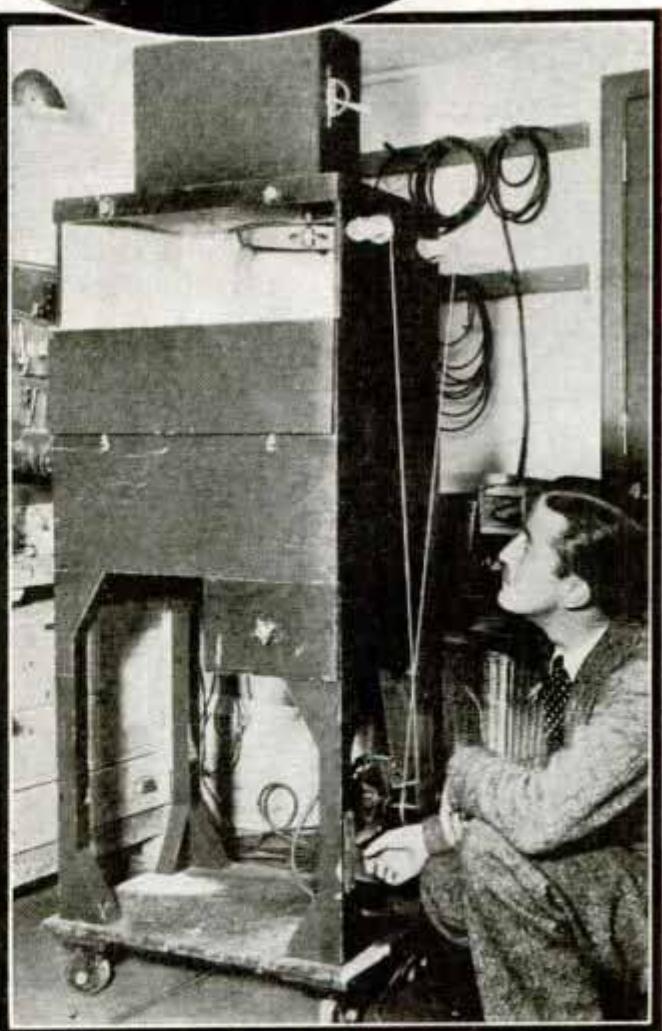
Of course, there is no horse and no glass mountain in the radio studio. The effect is produced by pouring a thin layer of sand into a cigar box, then pressing a drinking glass into the sand and twisting it a little, sending forth a glassy clatter that gives the impression of a horse's hoofs on a slippery, shattery surface.

This art of producing sound effects is growing more and more important in the radio drama. It is almost getting to be a science. The large studios have laboratories in which experts test out devices and methods of getting different sound ef-

fects. Some of the studios have complete libraries of records. In one studio over 150 records are kept on file ready for immediate use, besides one hundred or more extra records. About twenty of these records are of various noises made by airplanes, and others give different sounds of automobiles. There are also such noises as snores, typewriters, football crowds, the chopping of trees, monks chanting vespers and the croaking of bullfrogs.

Experts are always busy constructing sound-producing machines, many of them operated by turning a crank. One of these is a big wheel, which, as it is turned at whatever speed necessary, grinds over two small wooden cylinders, giving the effect of wagon wheels on a road. Sometimes the sound of a light patter of rain is obtained

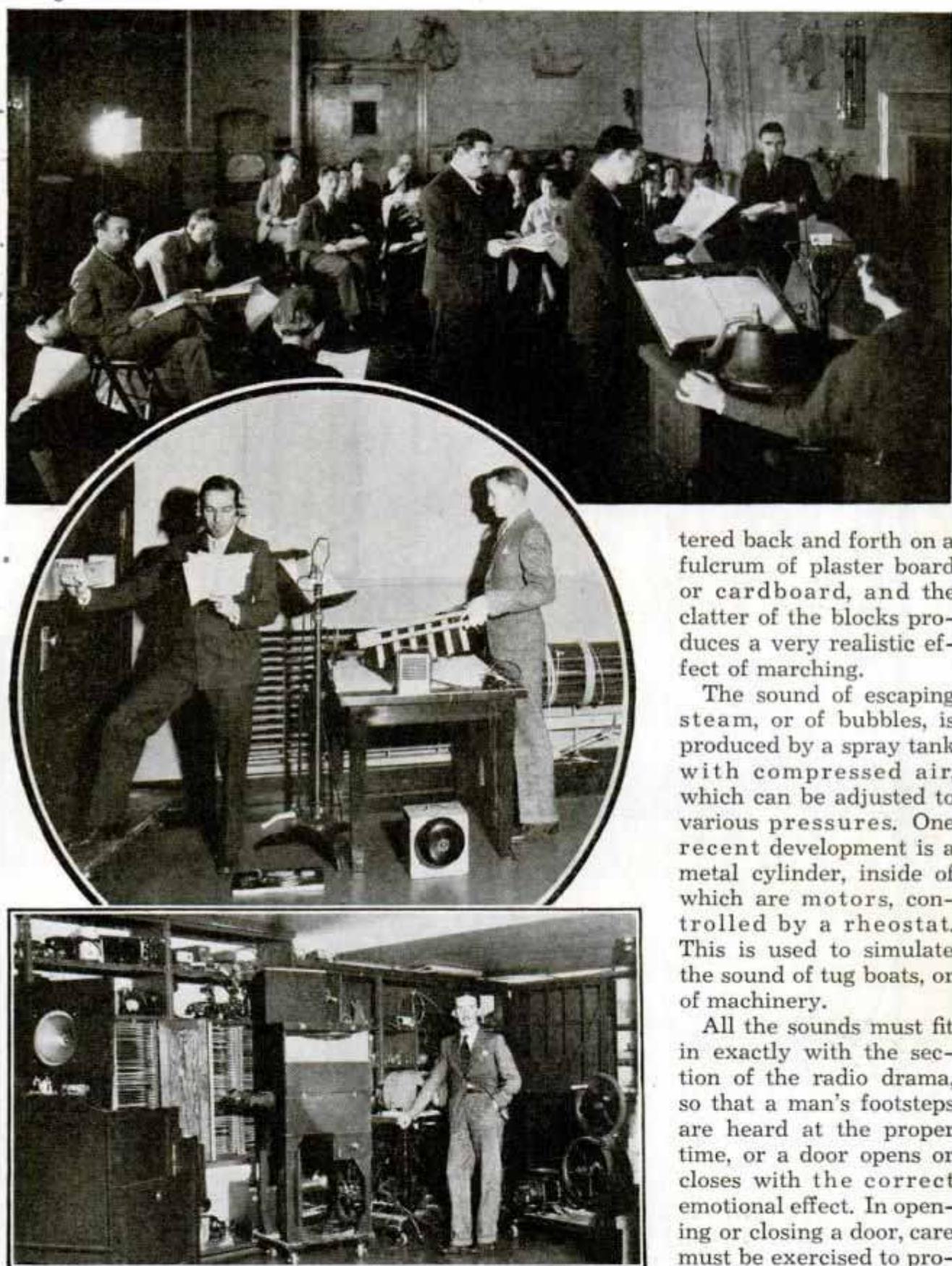
DRAMA



by the use of tissue paper. There is also a large rain machine by which a steady downpour of rain may be simulated. The effect is produced by dropping sand from a box at the top of the machine onto a sheet of metal below.

A paddle swished back and forth in a tub of water can produce the effect of a water wheel, water lapping against a dock, a rippling stream, or other sounds of water. Sometimes a tub is filled with soft mud, which, when beaten back and forth with a paddle, produces a sound

Left, Simulating Clanging of Prison Door; Right, Sound Effects Department; Bottom, Operating Rain Machine in NBC Studio



Top, Bell Used in One Program; Center, Sound Apparatus in Use; Bottom, Test Laboratory; Note Phonograph Record Library at Left

as of horses walking on a muddy road. The effect of a marching army is obtained by means of a frame onto which loose blocks are fastened by a cord. This is tee-

tered back and forth on a fulcrum of plaster board or cardboard, and the clatter of the blocks produces a very realistic effect of marching.

The sound of escaping steam, or of bubbles, is produced by a spray tank with compressed air, which can be adjusted to various pressures. One recent development is a metal cylinder, inside of which are motors, controlled by a rheostat. This is used to simulate the sound of tug boats, or of machinery.

All the sounds must fit in exactly with the section of the radio drama, so that a man's footsteps are heard at the proper time, or a door opens or closes with the correct emotional effect. In opening or closing a door, care must be exercised to produce the sound compatible with the mood of the actor. An angry man

open stealthily in a detective yarn, or be closed softly in case of illness. To produce these different sounds, long oblong boxes have been constructed, with an inside padding, and in some of them a hollow place back of the box to produce resonance. To these boxes are hinged small doors, complete with knobs and latches. To some of these boxes, screen doors also are attached, as the sound of the slamming of a screen door is different from that of a solid door. For the heavy clanging sound of a prison door, a barred iron door is used.

One piece of "property" is a flight of steps so constructed that anyone going up them can produce the illusion of actually mounting stairs.

Sometimes the sound is produced by the article, itself, for the laboratories have telephone instruments, cash registers, telegraph instruments, auto horns and train bells. One can hardly think of a sound for which the sound effects laboratories have not either the instrument or something to simulate the sound.

(Continued to page 126A)

WELDER MOUNTED ON TRACTOR USED IN RAILROAD YARDS

One California railroad yard is equipped with a welding generator mounted on a tractor and used for making all kinds of electrical welds about the yard. Since the



Portable Welding Outfit Mounted on Tractor and Used in Making Electrical Welds in Railroad Yards

unit is compact and portable, it usually is easier to bring the welder to the work than to take the work to the welding outfit.



Electric Cooler Which Blows Air around Eggs in Buckets Equipped with Screened Bottoms

QUALITY OF EGGS IS IMPROVED BY ELECTRIC COOLER

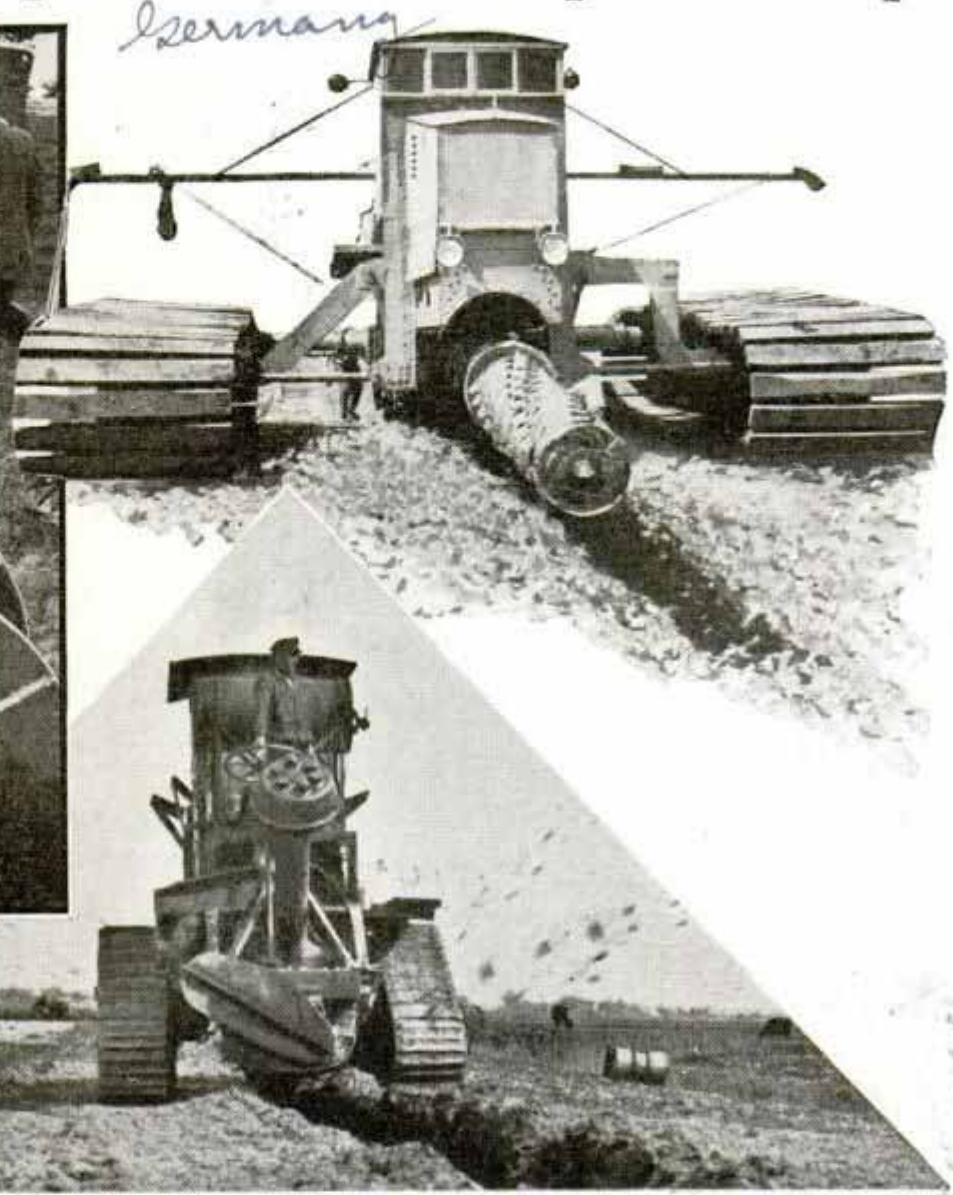
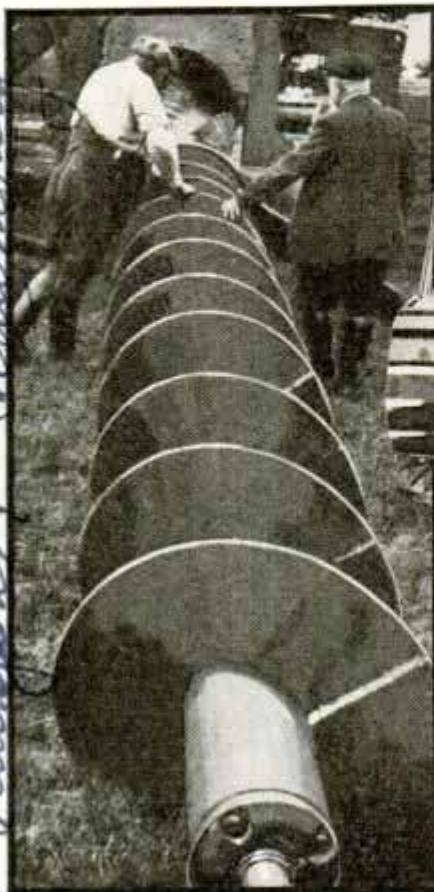
Rapid cooling of eggs to remove body heat is one factor in maintaining their fresh qualities and this is accomplished quickly and inexpensively with the aid of an electric cooler accommodating two buckets of eggs at once. It consists of a sheet metal box with two openings in the top and another in one end. A small electric fan draws air from the end opening and blows it through the two top openings. In the bottom of the box is a quart of water which is drawn up into blotters hung vertically, the process of evaporation aiding in the cooling. The buckets containing the eggs are equipped with screened bottoms and the cooled air is blown up through the bottoms and around the eggs.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.

D 1409

Berlin-Friedenau,

Excavator Digs Sub-Soil to Improve Crops



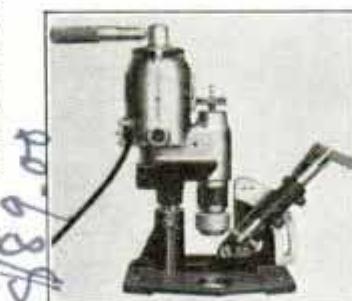
Left, Spiral Tube of Excavator Plow; Right, the Machine at Work; Below, Excavator Moving along Field, Throwing Sub-Soil to Either Side as It Is Dug Up by the Tube; Only Narrow Furrow Is Left

Valuable soil to help increase crops can be brought to the surface and mixed with the topsoil by an excavator developed in Germany. The machine does the work without removing the topsoil. Two chains are used for propulsion. A rotating tube, connected to the chassis by a rotary axle, is adjustable for depth. The tube is fitted with knifelike blades which cut the soil and cause it to drop through slits into the tube. A worm drive in the tube carries the earth to the top and discharges it fanlike to the right and left over the field. The upper section of the tube contains knives that throw the loosened earth behind them, in the manner of a burrowing mole. The only trace left is a narrow furrow. Preparation of the soil in this manner is said to

have improved some crops as much as thirty per cent.

D 1454

SMALL VALVE SEAT GRINDER HAS ECCENTRIC ACTION



Eccentric grinding of valve seats in the automobile service shop can be done rapidly and accurately with a low-cost tool now on the market. The grinder revolves at 10,000 revolutions to send the grinding wheel eccentrically around the valve seat at thirty revolutions

Hall Mfg. Co.
1150 N. 11th Street
Milwaukee, Wisconsin

Perfection
Windshield
Co.
25 W Pratt

per minute. The result is said to be equal to that of larger machines used by factories. The tool handles surface, in-head or recessed seats of stellite, high-speed steel or cast iron up to two and one-half inch diameter. It comes complete with diamond dresser for dressing grinding wheels to the angle desired.

D1377

ARMORED AUTO FOR POLICE HAS TIRE GUARDS

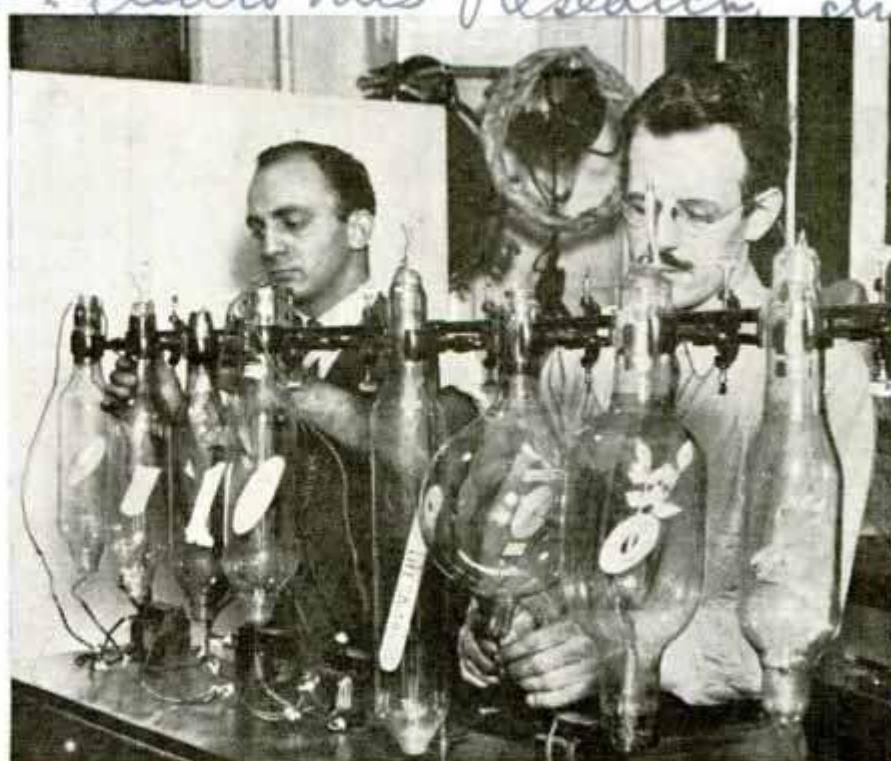
Constructed especially for chasing criminals, an armored police car in use at Lacrosse, Wis., even has its tires protected from bullets. The entire front of the automobile, a Buick, is made bullet-proof by the use of triple laminated glass in the windshield and windshield wings, the frames of which are of bullet-

resisting steel. The radiator guard is constructed of a special hardened steel wire mesh. Similarly constructed bullet-proof guards protect the tires and bullet-resisting steel lines the toe and headboards of the driving compartment. A gun port built into the windshield enables the police to fire ahead when pursuing cars.



CATHODE TUBES COLOR ADS WITH BRILLIANT LIGHT

Trade-marks and other forms of advertising can be illuminated in any color or combination of colors by a new method in which the cathode-ray tube is used. The tube is built in any size to house the advertising matter, which is coated with chemicals that become luminous under electronic bombardment. As the cathode



Cathode-Ray Tubes Built around Trade-Marks; Chemicals Are Used in Producing Brilliant Colors to Light the Advertising Emblems

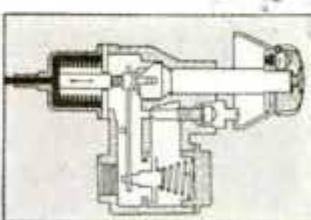
rays from the top of the tube strike the chemicals, the trade-mark becomes a brilliant array of colored light. Gilbert T. Schmidling, credited with inventing the first really cold light, has arranged about 400 shades for use in the tubes. The electronic flow is two-tenths of a milliamperc and current consumption is about ten watts. The cathode tube is said to be adaptable to many forms of advertising.

D1441

GAS OVEN HEAT REGULATOR HAS LIQUID CONTROL

Temperatures in the oven of a gas range can be controlled more accurately by a thermostat unit containing an expanding liquid. When the temperature approaches the point set by dial, the liquid expands, causing the unit to slowly close the gas jet, so that only enough fuel to maintain the heat desired is permitted to pass.

The accuracy is plus or minus two per cent. One feature is a by-pass valve that prevents the gas from being cut off entirely. The valve is provided for accidental cutting off of the gas supply.



The Wedcalator Co.
151 23 Nevada St.

228 40th St. New York City

Noisiest Room in World Is Echo Chamber



Reverberation Chamber Where Sound "Bounces" until a Gentle Cough May Echo Like Thunder

All the worst sound features are combined in the reverberation chamber of an

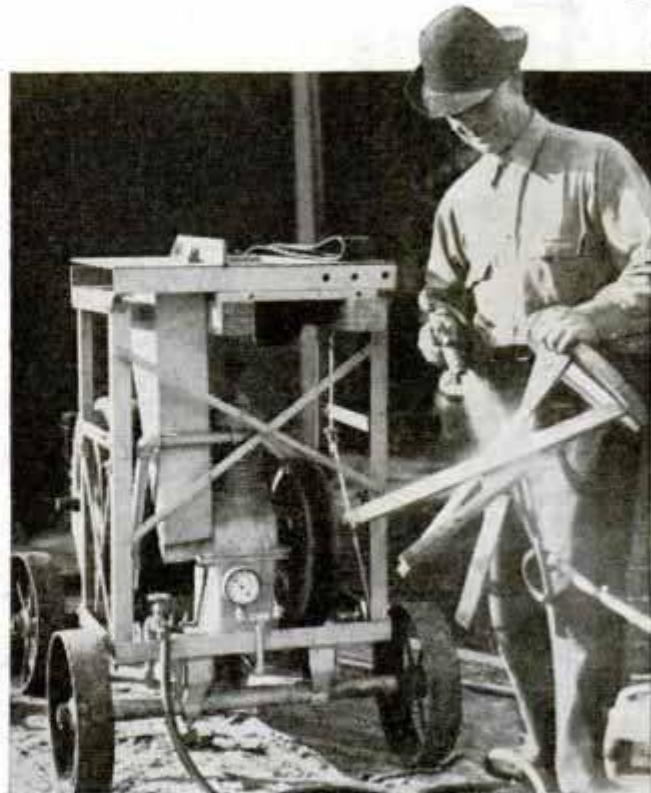
acoustical laboratory maintained by a factory making sound insulation materials. This chamber, known as the noisiest room in the world, looks like a carpenter's nightmare with the walls set at odd angles and the roof at a tilt. The walls are hard plaster and without absorptive materials, so the sound reverberates from walls, floor and ceiling. Three people clapping their hands in this room can stage a fair imitation of the applause of a packed theater for each sound lasts for twelve seconds and bounces off walls, floor and ceiling hundreds of times. A gentle cough echoes like thunder in a valley and the meowing of a cat resembles the roar of a lion. By gradually adding acoustical materials, the room can be made much quieter than one in a home. Next door to the noisy room is the "quietest room in the world," where rock wool felt padding is used to deaden all sound by absorption.

Rip Saw and Air Compressor Mounted on One-Man Rig

With a rip saw and an air compressor mounted on the same rig, a Californian is equipped to take on jobs as a sawyer or house and automobile painter. The air compressor operates a paint spray gun. The saw will handle any lumber used in the ordinary frame house. Power is furnished by a one and one-half horsepower gas engine. Belts from the engine pulley may be attached to either the saw or compressor. The rig can be hauled about and run by one operator.

SOD LAYER RETARDS EROSION

Farmers can save their topsoil from dissipation by winds with a machine which lays buffalo grass sod. This grass, an excellent anchor for the soil, is difficult to start from seed but grows readily when sodded. The machine cuts the sod into four-inch squares and drops one square on each three square feet of soil.



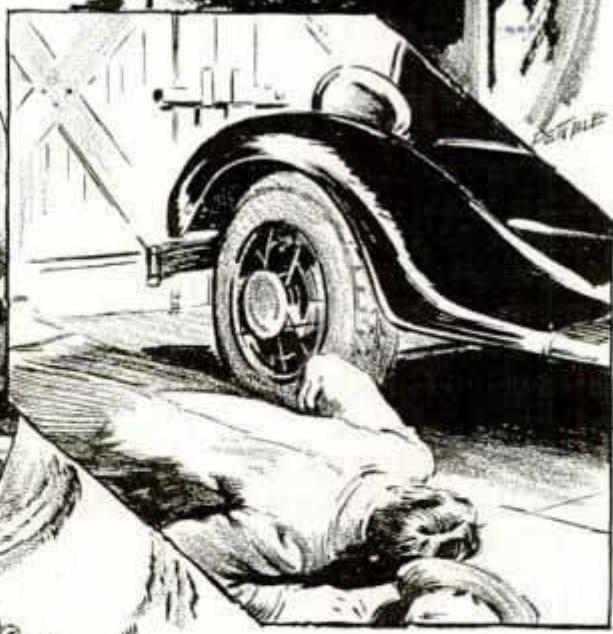
Rig with Saw and Spray Gun Operated by One Man

D1337 National Safety News
October, 1934
article by Dr. M. Bridgeman

The INVISIBLE KILLER!



Carbon Monoxide Is a Treacherous Killer That Attacks without Warning; It Is Formed from Incomplete Combustion of Carbonaceous Substances and Is Colorless, Odorless, Tasteless and Non-Irritating; It Produces Death by Asphyxiation and Stefansson, the Explorer, Has Told How He and His Companions Survived the Perils of the North but Were Nearly Asphyxiated by Carbon Monoxide from a Kerosene Stove Used in an Ice Hut without Ventilation



Always Provide for Ventilation in the Car; Carbon-Monoxide Fumes May Overcome You While at the Wheel, or While Your Car Is Standing with Engine Running; Don't, under Any Circumstances, Run the Motor of Your Car in a Closed Garage; This Is One of the Most Common Causes of Death from Carbon-Monoxide Poisoning

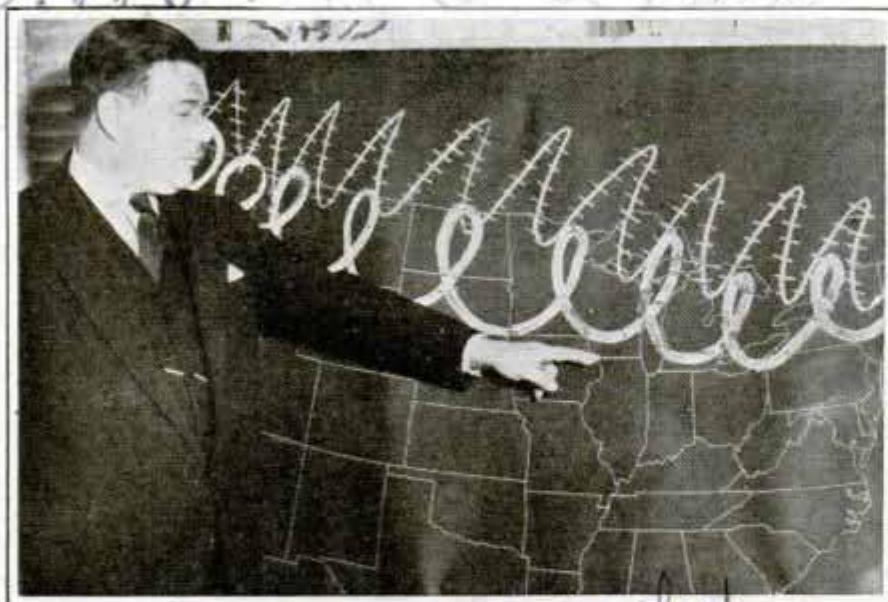


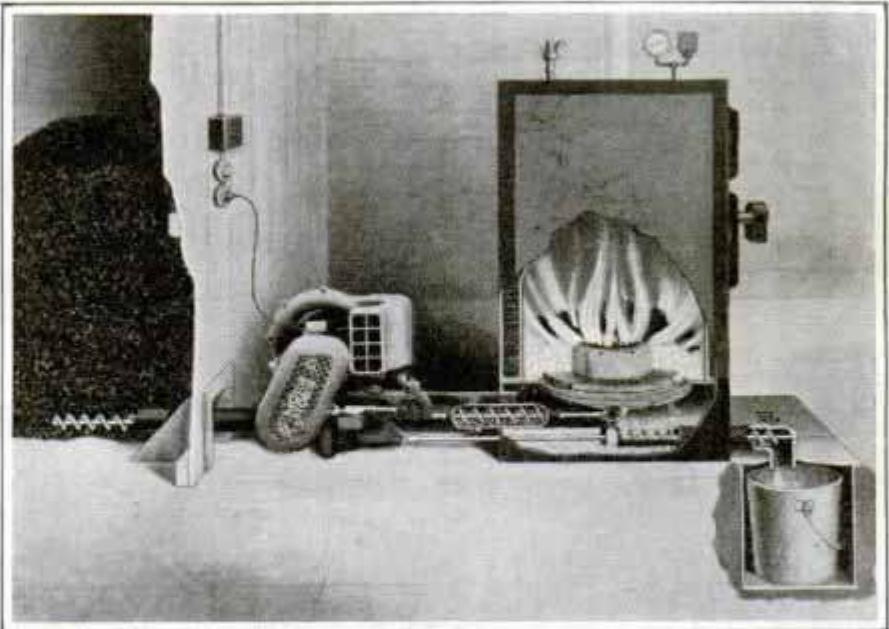
Chart of Low and High Pressure Areas Indicating an Extremely Cold Winter for the Season of 1934-1935

COLDEST WINTER IN A DECADE INDICATED BY CHART

New York City
After one of the driest summers the country has ever experienced, we are likely to have the coldest winter in a decade, if the accompanying weather chart tells the true story of what is in store for the winter of 1934-1935. The chart that predicts an exceptionally cold winter was prepared by Dr. A. M. Nielsen of New York university and shows low and high pressure areas for the northern section of the country. The lower trend represents the winter of 1933-1934, and the upper trend shows the coming winter. Dr. Nielsen says the fact that the areas will be moving from a more northerly point than last year indicates more cold is likely.

AUTOMATIC STOKER FEEDS COAL AND REMOVES ASHES

D/14 16
Stoking the home heating plant is made completely automatic by using a screw conveyor system to feed coal directly from the bin to the furnace. The ashes are removed, without dust, to a receptacle beneath the cellar floor and thermostats keep the house at any desired



Automatic Stoker Which Feeds Furnace and Removes Ashes; One Screw Conveyor Carries the Coal and Another Carries Away the Ashes

temperature. No periodic grate shaking is necessary as the regular grates are removed and a burner head which cleans itself holds the fire. The coal screw conveys pea-size coal from bin to furnace and the ash screw carries away the ashes. Both the feeder and ash worms are inclosed so these operations are clean. A one-fourth-horsepower electric motor supplies all necessary power and also operates a forced-draft fan, while a safety clutch stops the stoker in

case of an obstruction. Parts exposed to the fire are made of heat-resistant alloys. The burner head operates on the under-feed principle, coal being fed to the under side of the fire. Most of the smoke is eliminated since the gases pass upward through the fire and are burned. Movement in the burner head breaks up the coking coal and allows the forced draft from the fan to penetrate the fuel bed. Ashes sift through and are scraped by revolving paddles onto the ash conveyor.

D/15/7

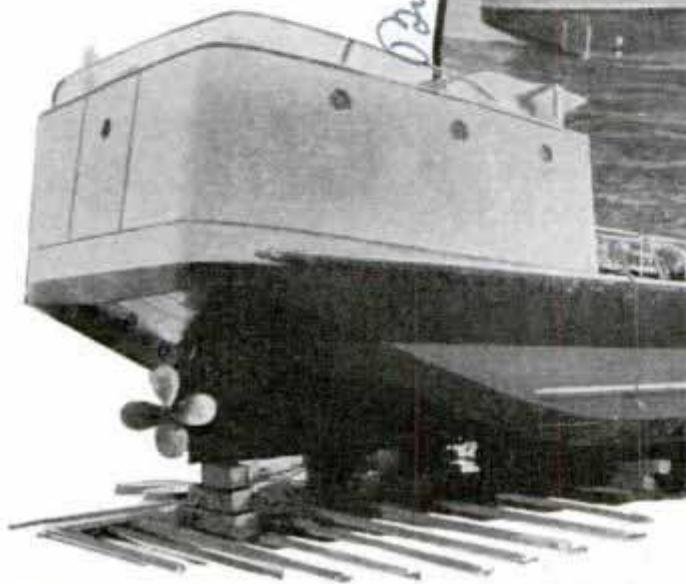
Patents are being issued at the rate of about 1,000 a week.

*Con. H. P. Behnke,
1919 State Ave*

*Pocahontas Fuel Co
12415 Cedar Road*

Swinging Propeller on Boat Replaces Rudder

Steering like an outboard motorboat, a sixty-five foot, shallow draft oil tanker has a propeller which swings forty-five degrees either side of center, thus giving the craft a quicker helm response and greater maneuverability than if it were fitted with a conven-

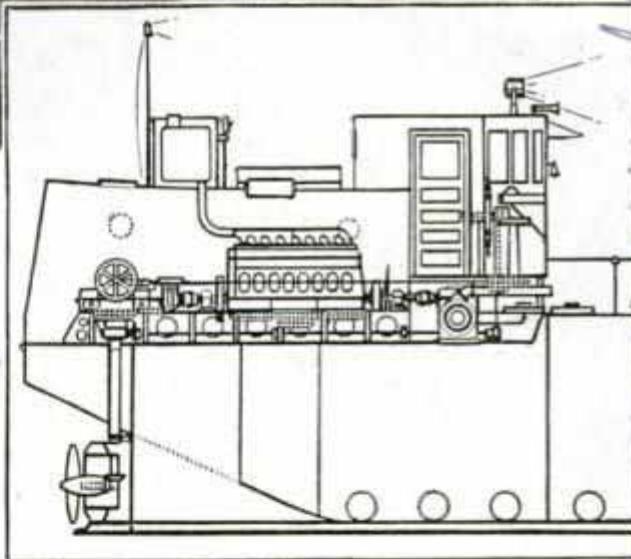
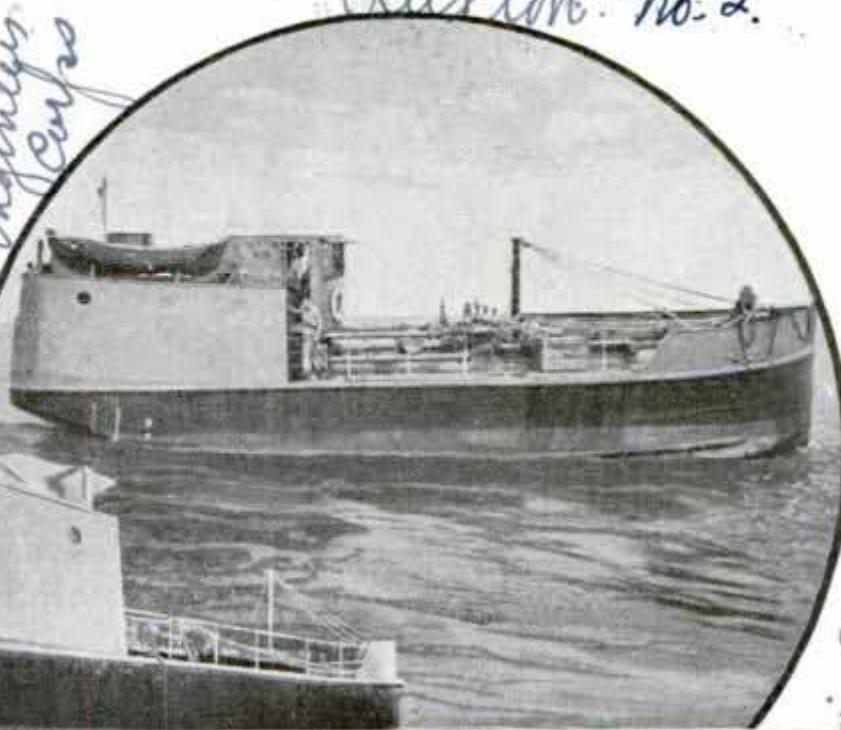


Oil Tanker with Swinging Propeller Which Steers Craft Like Outboard Motorboat; Diagram Shows How Engines Are Mounted on Deck

tional rudder. The craft can make a complete turn within its own length and its 140-horsepower Diesel engine is mounted on the after part of the main deck, leaving the entire space below available for cargo. In addition the engine is more accessible for making repairs and overhauling. An L-shaped power and driving assembly using the synchro-mesh gearing principle reduces the engine speed of 1,000 revolutions per minute to a propeller speed of 350. The propeller can be reversed without reversing the engine.

SERUM FOR BITE OF SPIDERS

To counteract the often fatal bite of the black widow spider, a highly potent anti-venom serum has been developed by Prof. Fred D'Amour of the University of Denver. It is obtained from the blood of rats which have been given regular small injections of the venom removed from the spider's glands. Due to their alarming in-



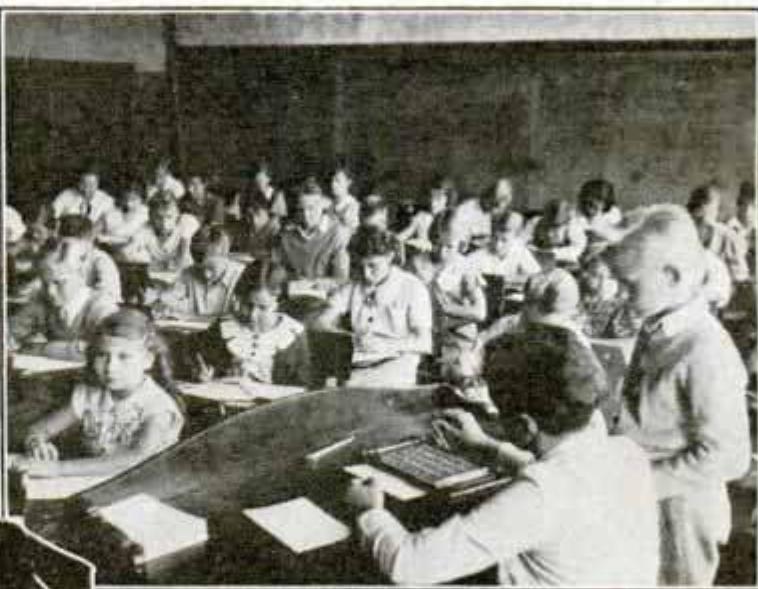
crease in numbers throughout the country, these spiders may become a greater menace than rattlesnakes for they invade homes, even in the cities, and several deaths from their bites have been reported in the past two years. Some vineyards in California have remained unpicked because workers feared to go among the vines infested with the spiders. The black widow is shiny jet-black, with a bulbous abdomen and long slender legs. The lower side of the abdomen is marked with red warning signs resembling an hour glass and for this reason the creature is also known as the hour-glass spider. Weight for weight, its venom is more deadly than that of the rattlesnake.

See March 16
Denver Colo.

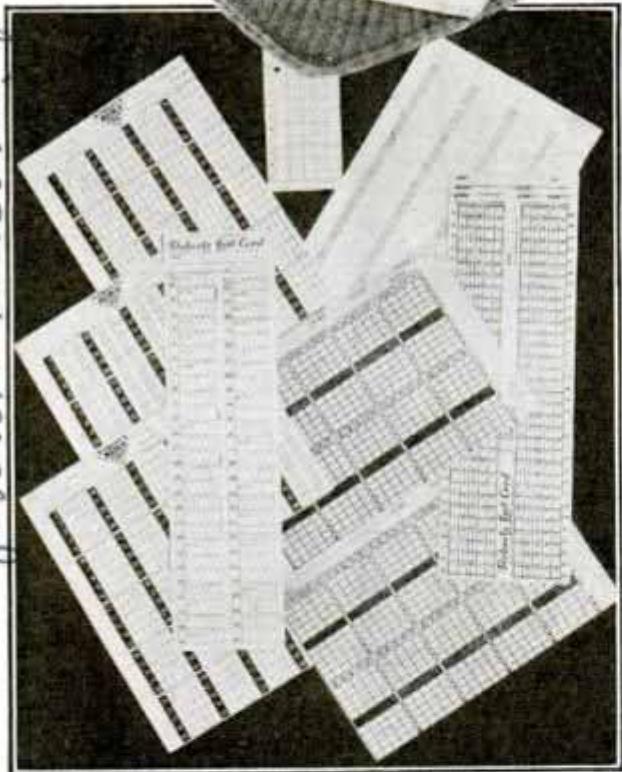
Science Service
11/23/34

Robot Grades Papers Faster in School Test

Pat. H 1,946,361
+ 1,958,174



Top, Left, Machine for Marking Test Papers; Right, Machine in Use in Classroom; Bottom, Sample Test Papers Graded by the Robot



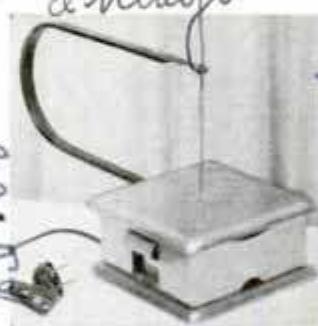
Grading of examination papers may be speeded up by a machine that does the work in a fraction of the time required by ordinary methods. Pupils are given cards on which to indicate answers to teacher-made or standardized questions. These cards are divided into squares and provide places on each side for answering 100 questions with five possible answers for each question. The pupil merely checks

the space which he believes to correspond with the correct answer. The teacher then sets the machine to indicate the correct answers. Each card is then run through the machine, the correct answers being marked with a red circle when the handle is pulled. The machine is said to be adjustable to any subject. Only thirteen inches long, the robot is easily portable.

D 1381

VENEER SAW WITHOUT MOTOR AIDS INLAY CRAFTSMAN

Operating at 7,200 strokes per minute, a small electric saw without a motor is available for inlay work. There are no rotating parts, nothing to adjust and the saw requires no oiling. While it will not injure its operator's fingers, the saw will cut at least five layers of natural veneers smoothly. It also will cut one-sixteenth-inch circles and right angles. Current consumption is said to be negligible. The saw is included in kits that also contain four sheets of veneer wood, a sheet of plywood and numerous pieces of woods for frame and border of inlays.



Auchterlonie Miller
13-145-19

D1344 Sam Brown, 15
Carhart St. Marion, Ohio



Have You a MASTER MEMORY?

Key Letter	Value
L	1
N	2
M	3
R	4
F	5
B	6
T	7
SH	8
G	9
S	0

- | | |
|-----------------|-------|
| 1. AISLE | (L) |
| 2. SUN | (N) |
| 3. MUD | (M) |
| 4. (STREET) CAR | (R) |
| 5. FOX | (F) |
| 6. BOX | (B) |
| 7. AUTO | (T) |
| 8. SHOP | (SH) |
| 9. DOG | (G) |
| 10. LASSO | (LS) |
| 11. PILLOW | (LL) |
| 12. LAWN | (LN) |
| 13. ELM (TREE) | (LM) |
| 14. LADDER | (LB) |
| 15. LOFT | (LF) |
| 16. LOBBY | (LB) |
| 17. PLATE | (LT) |
| 18. SPLASH | (LSH) |
| 19. LOG | (LG) |
| 20. NOOSE | (NS) |
| 21. NEEDLE | (NL) |
| 22. CANNIBAL | (NN) |
| 23. INMATE | (NM) |
| 24. CANARY | (NR) |
| 25. KNIFE | (NF) |
| 26. SNOWBALL | (NB) |
| 27. PANTS | (NT) |
| 28. NOTCH | (NCH) |
| 29. NIGGER | (NG) |
| 30. MOSES | (MS) |
| 31. CAMEL | (ML) |
| 32. MINE | (MN) |
| 33. IMMIGRANT | (MM) |
| 34. MARKET | (MR) |
| 35. MUFF | (MP) |
| 36. UMBRELLA | (MB) |
| 37. MATTRESS | (MT) |
| 38. MUSH | (MSH) |

"SECOND THROW
WAS SIX"



JONES was an ordinary business man, yet he astonished everyone with his spectacular memory feats. Listening attentively while his audience called out a list of fifty or even 100 common words, he would, immediately the list was complete, call back the words in their correct order. Moreover, he would repeat the list backwards. He would call out any word by number or give the right number to any word. He would allow six spectators to roll an ordinary die, each participant rolling the die six times. At the conclusion of the rolling, he would call out all six rolls of every participant, or announce any single roll in the whole group of thirty-six numbers!

What is the secret to such an uncanny performance? Is it natural memory—science—a trick? Could you do the same with the necessary knowledge and practice? You can and here's how.

Most memory feats depend upon codes, and the most versatile is the basic word list comprising, usually, 100 key words. Part of such a basic word list is shown here. The application of the code is simply a matter of associating these key words with the other words or numbers, and the

Malacol ^{rec} form
litter ~~the next~~

SECOND ROLL—SIX*
Picture the Thespian
with Freckles

NUMBER THROWN	KEY CHARACTER	FIRST ROLL (Describes Hat)	SECOND ROLL (Describes Face)	THIRD ROLL (Describes Neck)	FOURTH ROLL (Describes Coat)	FIFTH ROLL (Describes Legs)	SIXTH ROLL (Describes Feet)
1	YOUNG LADY	LADIES' HAT	ROUGED LIPS	HIGH NECK UNIFORM	ERMINNE WRAP	SILK STOCKINGS	HIGH HEELS
2	SOLDIER	OVERSEAS CAP	SCAR ON CHEEK	DIRTY COLLAR BAND	KHAKI COAT	ARMY BREECHES	YELLOW ARMY SHOES
3	TRAMP	MATTERED FELT	WHISKERS	RED HANKY	PATCHED COAT	BAGGY TROUSERS	TOES STICK OUT
4	COWBOY	16-GALLON HAT	TANNED	POLKA DOT TIE	CHECKERED SHIRT	CHASE	RIDING BOOTS
5	BUSINESS MAN	GRAY FELT	SMOOTH SHAVEN	BLUE SERGE	PRESSED TROUSERS	KNICKERS	BLACK OXFORDS
6	YOUNG BOY	CAP	FRECKLES	OPEN NECK SHIRT	SWEATER		SNEAKERS

"WRITE DOWN TWENTY INITIAL LETTERS"

Dress of Thespian as Visualized by Performer

DRESS VISUALIZED	NUMBER INDICATED
COWBOY HAT	FIRST ROLL—4
FRECKLES	SECOND—6
OPEN NECK	THIRD—6
PATCHED SHIRT	FOURTH—3
MILITARY BREECHES	FIFTH—2
RIDING BOOTS (Cowboy)	SIXTH—4

Above, Tables Show How Die Effect Is Worked;
Left, Starting Memory Test with Letters

making a mental picture: A big plate of mush, which you will lasso and feed to your pet camel!

Take this stunt of calling out fifty or more common objects such as carpet, box, shoe, wire, pole, saw, brick, cigaret. As each word is called, a spectator writes it down, giving it a number in orderly sequence. The performer, meanwhile, associates the new word with the key word of the same number. For example, the first word in the called-out list, "carpet," must be linked with the first key word, "aisle." The trend of thought runs something like this: Carpet—beautiful red carpet running down the aisle of a church. Box—an enormous box burning on top of the sun. Shoe—muddy shoes.

At first reading, this may sound rather foolish, but you will find these mental pictures are easily retained, and check back immediately to the new word. In recalling the list, you use the key words in regular order. Thus: Aisle. Aisle—now what does that mean—oh, yes, there was a beautiful red carpet down the aisle. Sun? Sure, there was a big box on top of the sun. Mud? Muddy shoes. And so on through the entire list. If someone asks for the fifth word in the new list, you immediately remember that the key letter with value (five) is F. This in turn gives the key

basis of the system, association of ideas, is immediately put into use in memorizing the original list of key words. The first word is "aisle." Picture an aisle in a church. Now, take the second word, "sun." Can you see the sun shining through the church window? What for? Why, to dry up the "mud."

If you will proceed, then go over this little story once or twice, you will soon master the first ten words in the basic list. In a similar manner, master the entire list. The number of the word must also be remembered, most codes being arranged so that words and numbers recall each other. In this code, certain letters have certain values, as shown in the diagram. Thus, "lawn," with key letters L and N, means No. 12. Worked backward, No. 12 means LN, easily recalling the key word, lawn.

With a list of key words thoroughly memorized, the performer can remember any other list of words or numbers. For example, your automobile license number is 381031. Applying the key words, you get "mush" (38), "lasso" (10), "camel" (31). These words are then memorized by

word, fox. Then you recall the word you associated with fox. Repeating the list backward is equally simple, since you need only repeat the key numbers to reveal the key words and then the words in the new list.

Many persons use a basic word list in remembering names and numbers in everyday life. Another trick based on these "mental pictures" is the rather unusual die effect mentioned. This demonstration of master memory



MONTH	VALUE	YEAR	VALUE
JANUARY	0	1900	0
FEBRUARY	1	1910	1
MARCH	3	1920	4
APRIL	6	1930	2
MAY	1	1931	3
JUNE	4	1932	5
JULY	8	1933	6
AUGUST	2	1934	1
SEPTEMBER	7	1935	3
OCTOBER	0	1936	1
NOVEMBER	2	1940	6
DECEMBER	5	1950	0

see correlation yellow sheet

Example:
 NOV. 22, 1934
 Date - - - 22
 Year Value 0
 Month Value 2

FOURTH
 DAY IS
 THURSDAY

Table for Working Calendar Trick and, at Right, Method of Riffling Cards for Doing That Trick

makes use of a code similar to the one illustrated. The performer's task is to memorize thirty-six numbers in a set order, and the code makes this possible. The performer invites each of six spectators to roll the die six times each. Each spectator keeps a record of his rolls. Jones, we will say, is the first man to roll. His first roll is a four.

The performer has thoroughly memorized the code shown, and the code is now applied in dressing Jones in a certain fashion which will later recall the numbers which Jones rolled. This mental

"dressing" starts at the head, and proceeds to the feet. The first roll describes the hat. Jones' roll of four gives the performer the key character, "cowboy"; therefore, Jones is immediately pictured as wearing a ten-gallon cowboy hat. On his second roll, Jones throws a six. The second roll describes the face, and number six means a "young boy." The code gives "freckles," and Jones is now dressed in a ten-gallon cowboy

hat, with a whole mob of freckles on cheeks and nose. Proceeding with the other rolls, the performer finally has Jones dressed in the manner shown in the sketch.

Now, when Jones asks the performer what his second roll was, the performer immediately knows that second roll means a description of the face. He calls up his mental picture, and sees Jones with freckles. In the list of characters, freckles recalls a young boy, and young boy means six. "Your second roll was a six-spot!" In a similar manner, any of the thirty-six

(Continued to page 130A)

D1407

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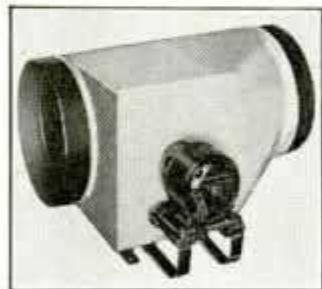
POPULAR MECHANICS
Paul Rochester NY

Memo Pad with Electric Light Which Illuminates Both the Pad and the Dial Telephone

LIGHT ON MEMORANDUM PAD ILLUMINATES PHONE DIAL

For the home or office equipped with a dial telephone, a memorandum pad is now available which serves a double purpose. The pad contains a small light which can be plugged into any outlet. A turn of the switch on the pad frame illuminates both the pad and the phone dial. Refills for the pad holder are of a standard size and can be obtained in almost any stationery shop.

D1393 BOOSTER FAN ON FURNACE PIPE FORCES WARM AIR TO ROOM



Rooms which are difficult to heat with a warm-air furnace because of their distance from the central unit or because the air does not flow readily can be warmed to any desired temperature by inserting a hustler fan unit in the pipe running to any such room. The booster fan consists of a short section of pipe of the same diameter as that carrying the warm air, a sheet-metal cabinet being attached to this pipe.

American Foundry + Foundry Co. Inc.

This cabinet incloses a small aluminum centrifugal blower driven by an electric motor. The motor is located outside the cabinet and so is unaffected by the heated air. Control can be manual or by means of an automatic thermostat. For manual control, a switch is placed in the room to which the heat pipe runs. When more heat is desired, the switch is turned to start the motor. When the motor is not operating, there is no interference with the passage of the warmed air.

D1273

GLASS DISKS HELD TOGETHER BY MOLECULAR ATTRACTION

Two pieces of optical glass, prepared by Bausch and Lomb as part of an optical exhibit, are so accurately ground and so highly polished that they will resist a separating force of from ninety-five to 100 pounds per square inch. The two glass disks supporting the girl in the photograph are not attached to each other by any exterior means, but are held together by



The Two Glass Disks Supporting the Girl Are Held Together by Molecular Attraction

molecular attraction. The surfaces of the disks are accurate to within one millionth of an inch.

There is one birth every fourteen seconds in the United States, one death every twenty-three seconds, one immigrant every fourteen minutes and one emigrant every five minutes—a net gain of one every thirty-seven seconds or 853,000 a year.

Outboard Motor Drives Sled Built from Kit



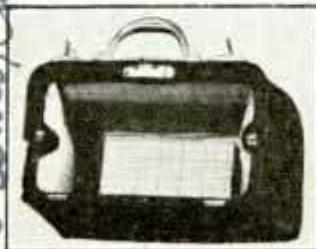
Above, Latest Ice Racer with Streamlines; Bottom, Close-Up of Nose Showing Outboard Motor and Propeller

Winter use of the outboard motor is made possible by the introduction of a fast, power sled that may be constructed from parts supplied in kit form. Installation of the outboard is simple, since it involves nothing more than mounting the motor and attaching it to the propeller. A two and one-half horsepower with a four-foot air screw drives the sled at thirty-five to forty miles per hour. The sled is a single seater. Warm air from the radiator flows into the cockpit through vents in the dash. Spark lever and throttle are easily reached from the pilot's seat and a brake lever is mounted in the cockpit. The craft is steered by wheel. The fuselage is of spruce and plywood, faired to a streamline skeleton and covered with canvas, doped and painted.

D/395 MONEY BAG SOUNDS ALARM WHEN STOLEN

Equipped with an electric bell and small batteries, a money bag now offered sounds an automatic alarm when snatched by a thief. The bag looks like an ordinary satchel, but on the under side of the handle is a trigger which is held in by the

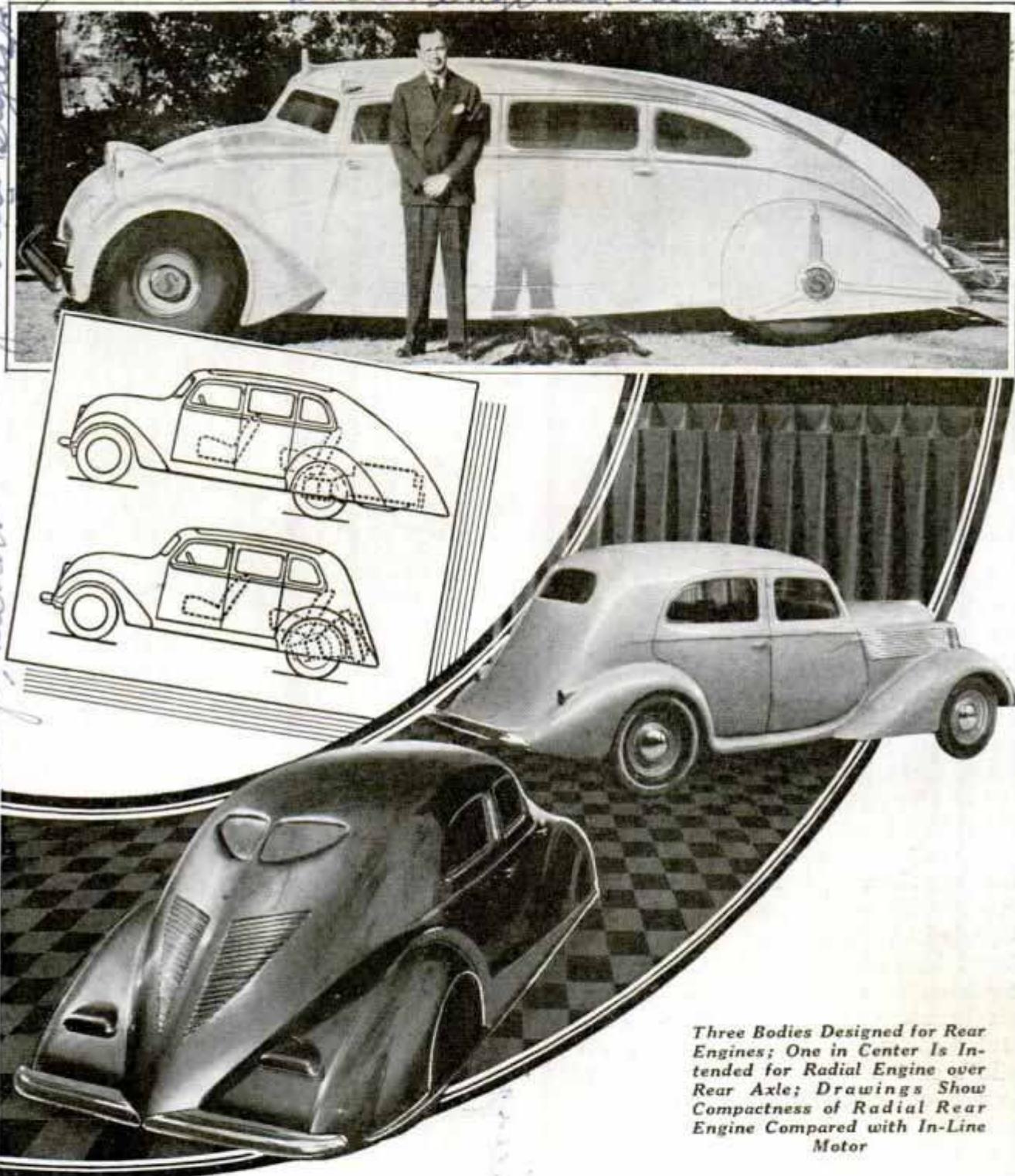
carrier's fingers. When the bag is snatched from the hand, however, the trigger is released and an electrical connection is made with the bell which rings continuously as the thief tries to escape, since the trigger cannot be pushed back into place without a key and the key is in the possession of the carrier.



(A rubber fabric as transparent as window glass has been developed.

Airplane Engine Adapted to Streamline Car

Dutch engineer and artist



Three Bodies Designed for Rear Engines; One in Center Is Intended for Radial Engine over Rear Axle; Drawings Show Compactness of Radial Rear Engine Compared with In-Line Motor

With the continuation of streamlining, automobile designers are considering moving the engine to the rear of the car. It is estimated that by adopting a radial, or airplane type, of engine to use in an automobile, three to three and one-half pounds per horsepower could be attained without departing from conventional engine materials. Since many authorities vision the car of the future as being light in

weight compared with present models, the radial engine offers many advantages. It is not only lighter and more powerful, but its shape permits it to be mounted snugly behind the rear axle without causing awkward contours in the body design. Whereas five or six pounds per horsepower is considered good practice in the in-line motor, aeronautical engineers are not satisfied with two pounds of weight per

horsepower and are working toward one pound per horsepower. The radial engine also lends itself to air cooling, thus eliminating water and radiator and lessening weight still further. L. B. Kalb, of Continental Motors, says that most of the noise associated with a radial engine when used in a plane can be overcome when the engine is applied to the automobile. William B. Stout, well known automotive and aeronautical engineer, maintains that lighter weight and smaller engines as a result of experience with aluminum cylinder heads will bring the air-cooled engine into use for automobiles. "Rear engine drive really should have come into the automobile industry long before now," says Mr. Stout, "but it has been given serious study only since the importance of streamlining began to be appreciated."

MEMORIAL TO ORE SHIPPING BUILT IN PORT TOWN

As a memorial to the ore-shipping business, a large ball made of hundreds of

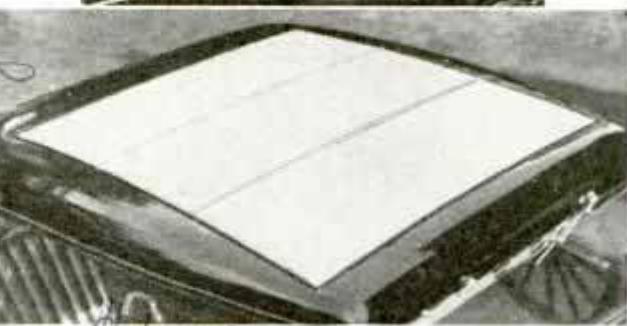
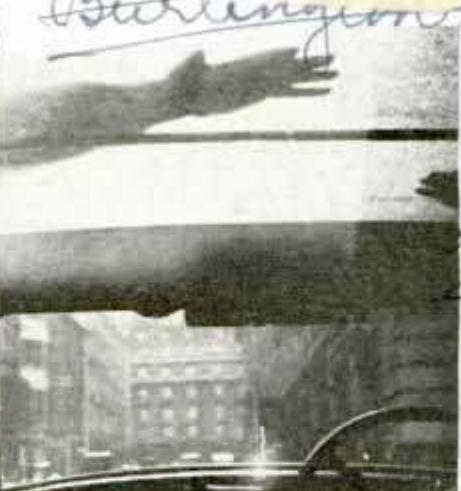


Ore Port Memorial Consisting of Large Ball with Base; Both Are Ore and Concrete

pieces of hard ore has been erected upon a base at Two Harbors, Minn. It marks the fiftieth anniversary of the first ore shipment through that port. The memorial ball or globe is faced with a plaque bearing a commemorative inscription.

D 1341

Two Harbors Minnesota



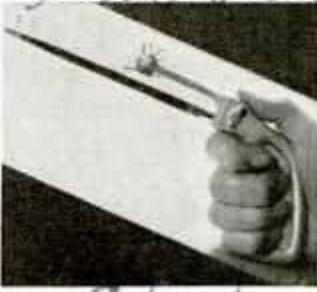
Top, Looking Upward through Translucent Roof of Auto; Bottom, Car Roof from Above

SUNSHINE AUTO TOP MATERIAL IS FIRE AND WATER PROOF

Non-combustible and waterproof, a new material is available in England for fitting automobiles, factories, greenhouses and similar vehicles and buildings with sunshine roofs. It consists of a fine wire mesh impregnated under great pressure with a translucent substance. While admitting light, sunshine and ultraviolet rays, it keeps out water.

SAW FILER WITH PISTOL GRIP HAS ADJUSTABLE GUIDE

Filing saws is made easier by using a balanced pistol grip for the file which gives a firm, convenient handhold, free from cramp or muscular strain. A guide rod, adjustable to any angle, detects the slightest variation in the filing.



Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Drawn by C. J. Wilson

8/1-08

D1388

Calgary Valley
Ranch, High River,
Alberta, Canada

Looking AHEAD

By Frazier Hunt



NO ONE ever would have crossed the ocean if he could have gotten off the ship in the storm



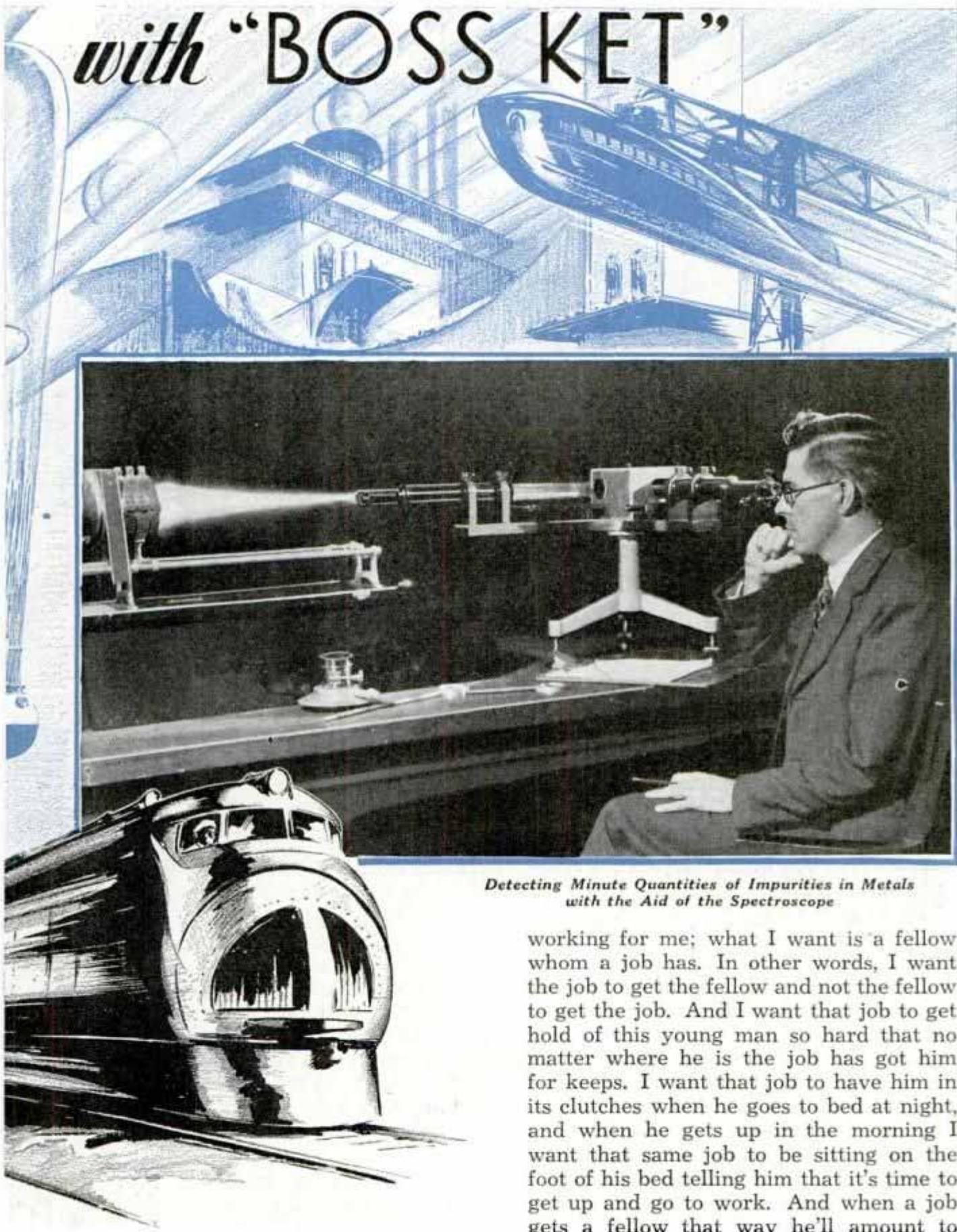
Electric Much.

THIS Charles F. Kettering, head of the great experimental laboratories of the General Motors company, is a dispeller of gloom and a true champion of hope.

"Why there is ten times more opportunity right now than there was in my day, thirty or forty years ago," "Boss Ket" fairly barked at me. "It's true that young men right now are having trouble finding a job, but that shouldn't keep them from going ahead and learning something. If

Top, Charles F. Kettering—"Boss Ket" to His Boys in the Research Laboratories of General Motors—Says What the World Needs Most Today Is a Whole Crop of New Inventions and a Flock of Brand New Ideas Instead of Warming Over Our Old Conception of Things

with "BOSS KET"



*Detecting Minute Quantities of Impurities in Metals
with the Aid of the Spectroscope*

working for me; what I want is a fellow whom a job has. In other words, I want the job to get the fellow and not the fellow to get the job. And I want that job to get hold of this young man so hard that no matter where he is the job has got him for keeps. I want that job to have him in its clutches when he goes to bed at night, and when he gets up in the morning I want that same job to be sitting on the foot of his bed telling him that it's time to get up and go to work. And when a job gets a fellow that way he'll amount to something."

"But there are thousands of young men eager to be captured by a job right now," I argued.

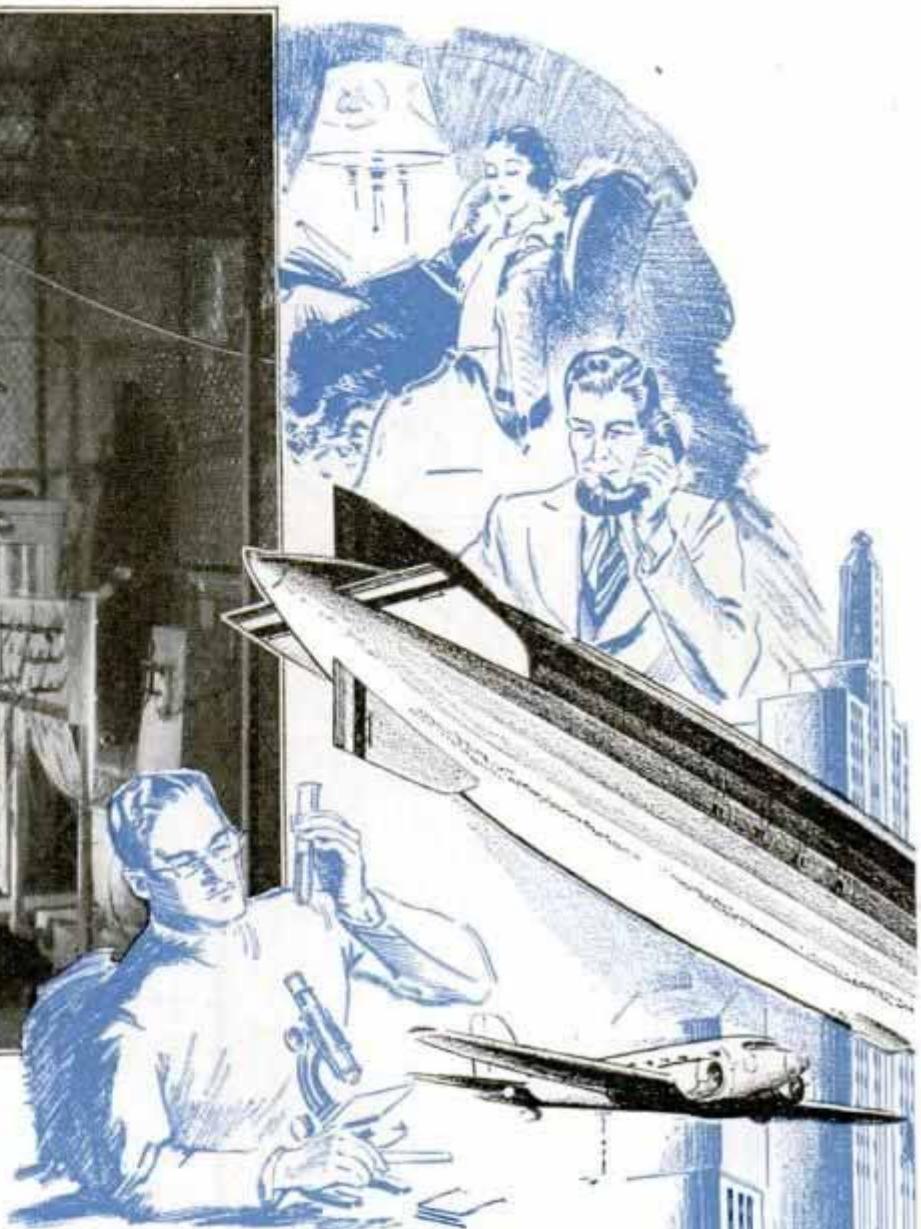
"Boss Ket" crossed his long legs and

all a fellow wants out of life is a job, then he doesn't want much, and he won't go very far.

"You know I often tell my people that I don't want any fellow who has a job



The Transformer in This High-Tension Wire Cage at the General Motors Research Laboratories Has a Capacity of 100,000 Volts



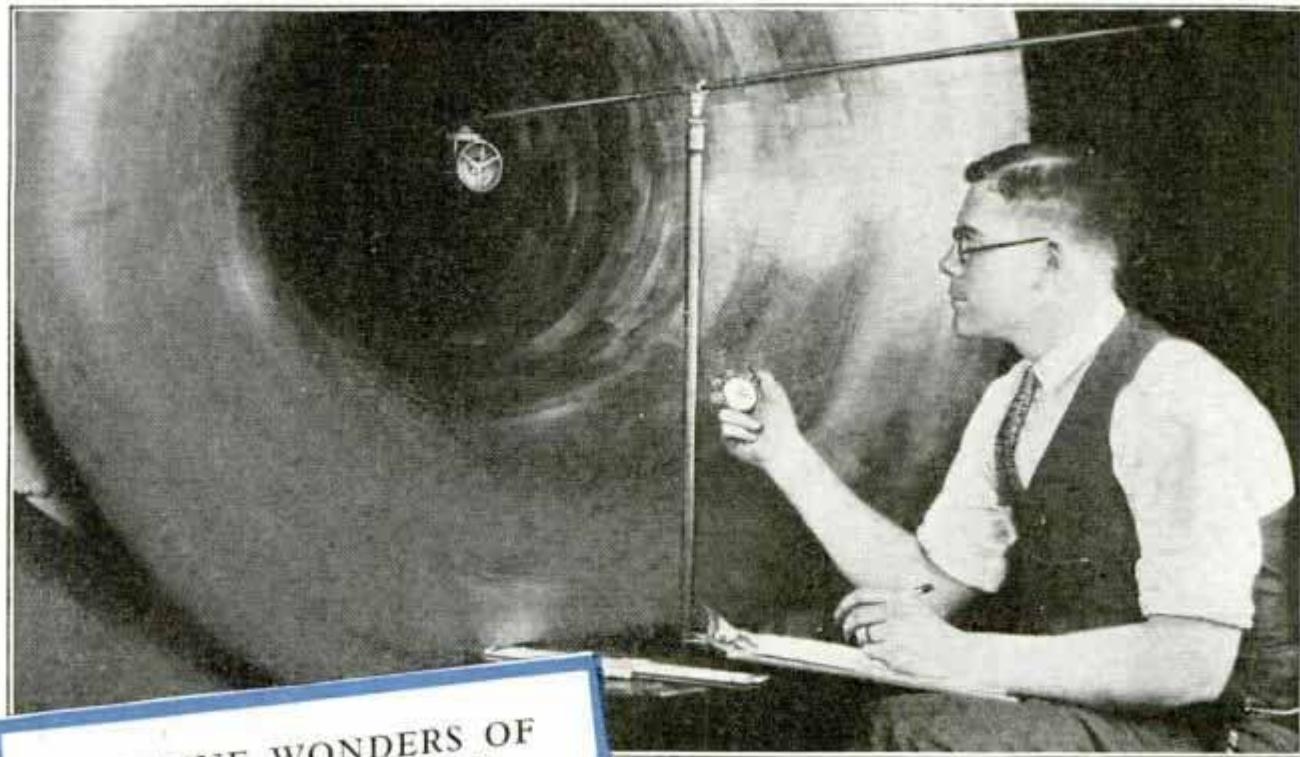
looked at me out of his deep-set, understanding, black eyes.

"That's a temporary condition, mostly the result of the upheaval caused by the war," he answered. "The thing is for a young man not to get discouraged because a job doesn't tap him on the shoulder, like the secret societies at Yale used to do on Tap Day. Somehow or other he must go ahead learning things—preparing himself for the day when the tap does come. He's got to keep his eye on his main objective in life. He's got to keep on, remembering that he can't lose an investment stored in his mind."

"What we need more than anything else now is brand new ideas. We've about used up our old stock. We've been occupied in making things instead of creating them. In standardizing production we unfortunately standardized ideas. We've made

over and over again the same old things, when we should be constantly making new things—endlessly changing. We've got to start all over again and create a whole new crop of new ideas, new things.

"You see we've used most of the knowledge that was handed down to us by the great scientific minds of sixty or seventy years ago. Now we must have some new knowledge to work on. Probably it will have to do with the nature of man and his world. College professors would call it biological chemistry. It's a field as broad as life. Why, it's just that—man and life. Let today's youth take hold of



THE NINE WONDERS OF THE MODERN WORLD

The discovery of bacteria and the application of bacteriology to human welfare.

The progress of our knowledge of the constitution of matter and radiation phenomena.

New methods of structure building with both metal and cement.

The progress of electricity as to light, power and communication.

The internal combustion engine and its application.

Modern metallurgy.

Processes of food preservation, including canning and refrigeration.

Aircraft and aerial navigation.

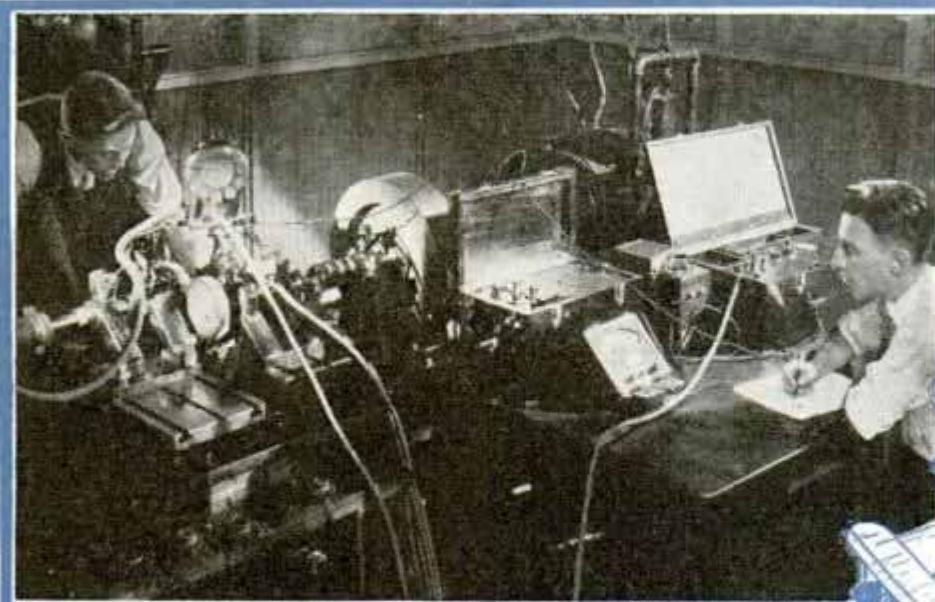
The development of machinery to lessen the burden of labor and to increase its output.

The Wind Tunnel Is Playing an Increasingly Important Part in Laboratory Research

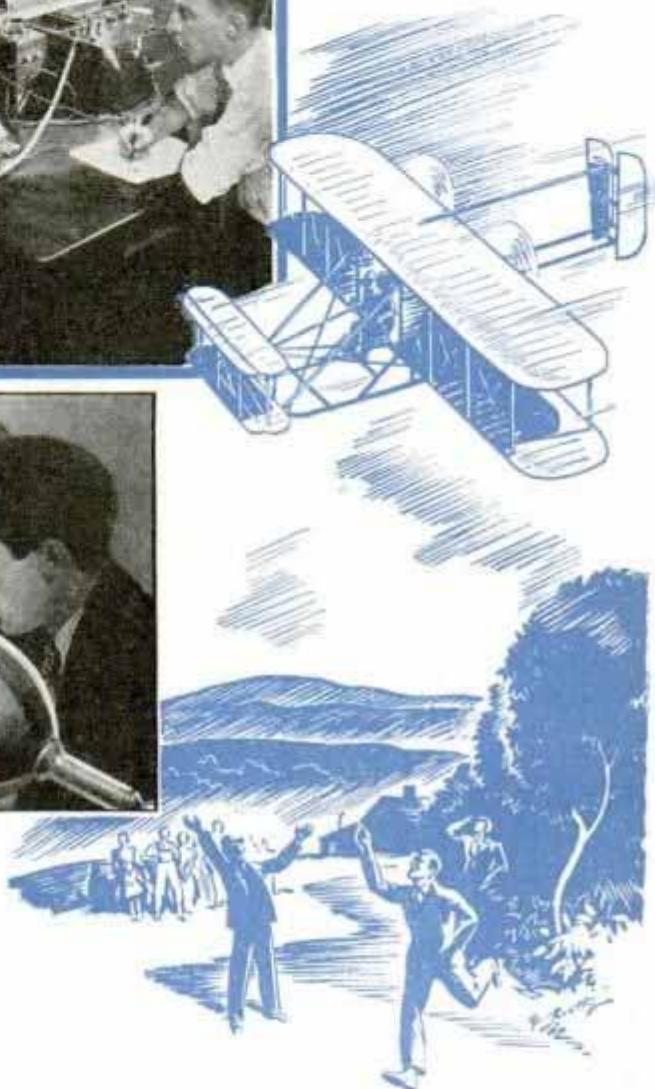
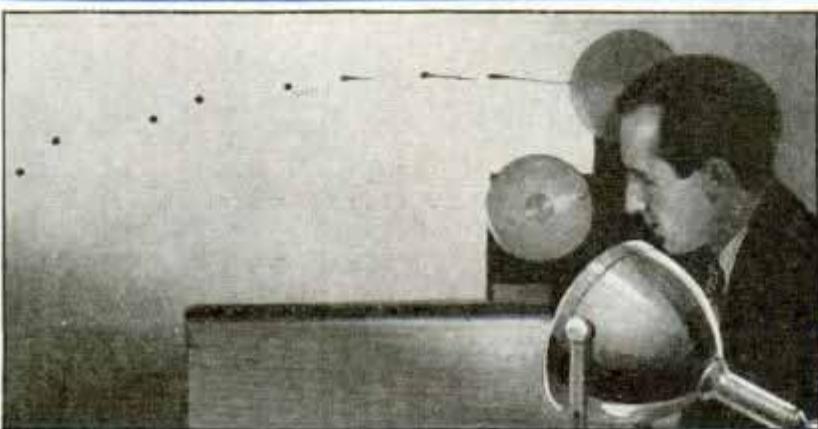
that idea. Say, the ground of knowledge hasn't even begun to be scratched. You see, real education is something like climbing up a mountain side—the higher up you go the more you see."

Until he was twenty-two and started to Ohio State University, Kettering was a poor, raw-boned, Ohio country boy who had worked hard every day of his life. That day, thirty-five years ago, when he registered in the engineering school, he had \$35 in his pocket. It was all he had and no one was to give him or lend him any more. It took him five years to finish college—and then he threw his





Listening to Gear Noise with the Aid of Vacuum-Tube Amplifiers and Using a Stroboscope to Study the Movement of Oil in High-Speed Machinery



diploma in the wastebasket. "I didn't come here for that; I came here to learn something," he said. He had learned something. He had learned to think for himself. He had learned to distrust all don'ts. He figures that what we don't know is at least a hundred times more than what we do know. And he believes that much of future knowledge—elemental knowledge about the structure of man and his world—is now held in check by words, figures, formulæ, many of which are wrong. He says that we must go back and plow under a lot of the "laws" and "don'ts" given us when science was young.

"Boss Ket" took me to a room across from his office and stopped in front of a motor. It was set on a pedestal, almost as if it were a bust or statue.

"About the same time I was going to college there were two home-trained mechanics running a little bicycle shop in Dayton," he said. "They had the fantastic idea that man could build a machine in which he could fly. They watched birds

and tinkered with homemade motors. A sister who taught school helped them with her savings, and they just kept at it. They wouldn't be licked. Most people laughed at them, but they went right on. And sure enough they did fly. That engine there is the second or third model they built. They let a job get them."

We walked over toward a glass case. At one end was a strange collection consisting of a candle, an old-fashioned Edison lamp, and a modern Mazda bulb.

"See that?" Kettering questioned. "One hundred and thirty of those tallow candles burning 1,000 hours would cost today \$1,500. Now it would take eight of those original Edison lamps to equal 130 can-

D 128
dles, and if you burned these eight 1,000 hours the expense would be \$68.75. But this new 100-watt Mazda lamp, with its 130 candlepower, will burn 1,000 hours at a total cost of \$7.35. And someone who reads this in Popular Mechanics may add a fourth and possibly a fifth lamp to this exhibit.

"He'll have a hundred times the chances Edison had. Did you know Edison never went to school but three months in his whole life, and then he was sent home because his teacher said he was too dumb to bother with? But school had nothing to do with his insatiable thirst for knowledge. Why, you couldn't stop him.

"People fail to remember that there is no such thing as fixity in anything in life," he went on. "There is nothing static. Everything is in perpetual change. The main trouble with our industry today is that we got to making the same things over and over again. We got interested in making things and not in changing things. That's where the scientist, the inventor, the creator comes in. He's interested in change. He wants to see new things come to life."

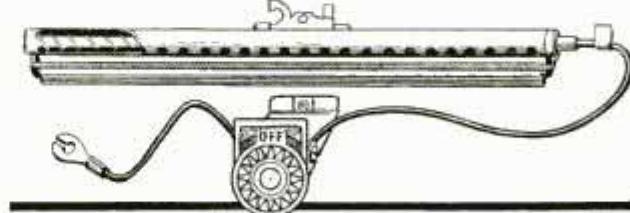
"Take the whole field of the motor car today. We are just beginning to recognize now that the possibility of developing real power from internal-combustion engines is in its infancy—that we are just on the verge of real development. It's hard to believe, but our motor cars today deliver under normal driving conditions only about eight or ten per cent of the total energy in the fuel they consume. That means that a small car could actually get something like 200 or 300 miles for every gallon of gasoline used."

"Boss Ket" was right at home when he was talking about motor fuel. He and his boys had developed ethyl gas, along with many other things including the self-starter. Many industries exist today because of his untiring activities.

"What'll the future car be?" I interrupted.

"I haven't any idea," replied "Boss Ket," "only I'm certain of one thing—the passengers will come first in the new car. I mean by that, they and not the engine will be given the first consideration. Up to the present we have been building a car

(Continued to page 118A)

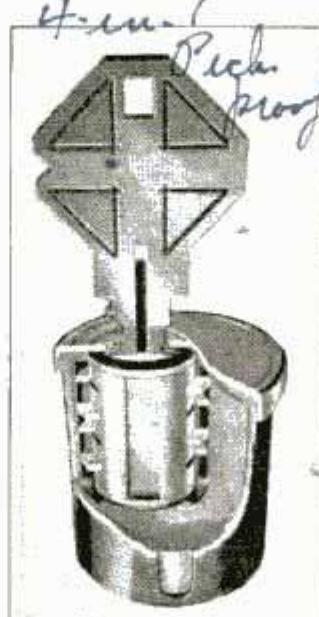


Top, Operating Dash Control of Heater Wiper Blade; Bottom, Sketch of Heater Blade

HEATER ON WIPER HELPS CLEAN WINDSHIELD

Electrically heated by current from the battery, a new windshield wiper blade keeps the glass cleaner in all weather. An ultra-violet glass tube throws out a steady heat that helps to melt ice and snow as the wiper moves back and forth. The blade is made of long-life rubber with ten contact points. The heater blade is controlled by an "on-and-off" dash switch that has a tell-tale lamp to warn the driver to stop the wiper when parking.

PICK-PROOF CYLINDER LOCK HAS FOUR-EDGE KEY



Constructed of armor steel and containing four rows of pin tumblers instead of one, a new cylinder lock is regarded as pick-proof. It has a four-edge key with a registry tag which permits only the owner to order a duplicate key. The lock's hardened steel box strike averts jimmying.

*Electric Automobile
Benton, N.J.*

Schuckerting

Chicago

*Cold.
Covered*

Hudley Lock Co.

537 S Dearborn

POPULAR MECHANICS

Chicago

D1054.



Covered Rack for the Angle Parking of Bicycles; Such Racks Are Widely Used in Berlin

COVERED RACK FOR BICYCLES MAKES PARKING EASY

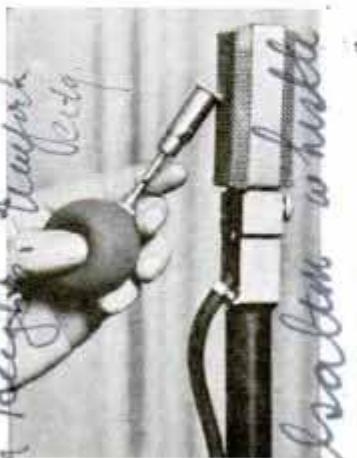
Parked from either side and raised at an angle, bicycles are parked easily under a covered rack in Berlin. The rack serves a large number of bicycle owners, since it is located in crowded Alexander Platz, in the heart of the city where parking space is scarce.

RADIO WHISTLE YOU CAN "SEE" BUT CAN'T HEAR

D1436

High fidelity radio broadcasting, covering virtually the full range of audible sound, requires the transmitting of extremely high frequencies and a simple device, known as a Galton whistle, is used to

test these high frequencies as transmitted by a New York high fidelity station. This station, W2XR, has a flat frequency characteristic of from twenty-five to 15,000 cycles. The testing device, known to workers in physics laboratories, has an extremely high pitch



made variable by turning a knurled screw at the top. By pressing the rubber bulb

871 London Road
Cleveland Ohio

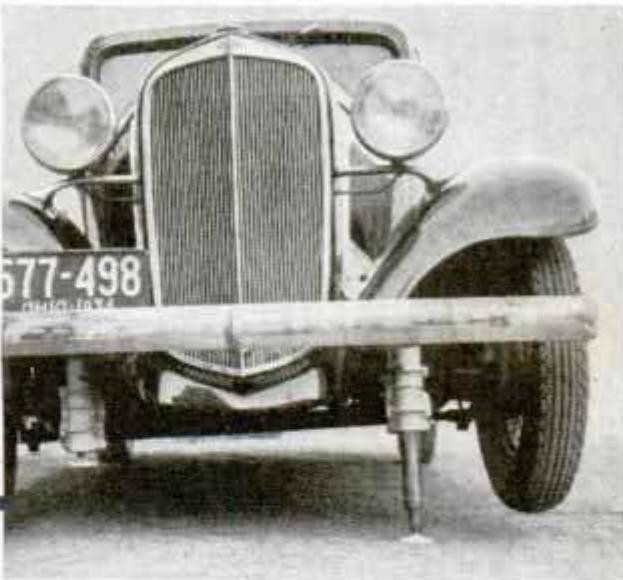
and turning the screw the pitch becomes higher and higher until it goes beyond audibility. A graduated scale gives the frequency readings and the engineer "sees" the whistle in his meters although he may not be able to hear it.

D1407

DASH-CONTROLLED JACK FOR AUTO OPERATED AUTOMATICALLY

See page 54/9
Four hydraulic jacks mounted adjacent to each wheel of the automobile and all controlled independently or simultaneously from a dial on the dash enable the motorist to raise one wheel or the entire car without leaving his seat.

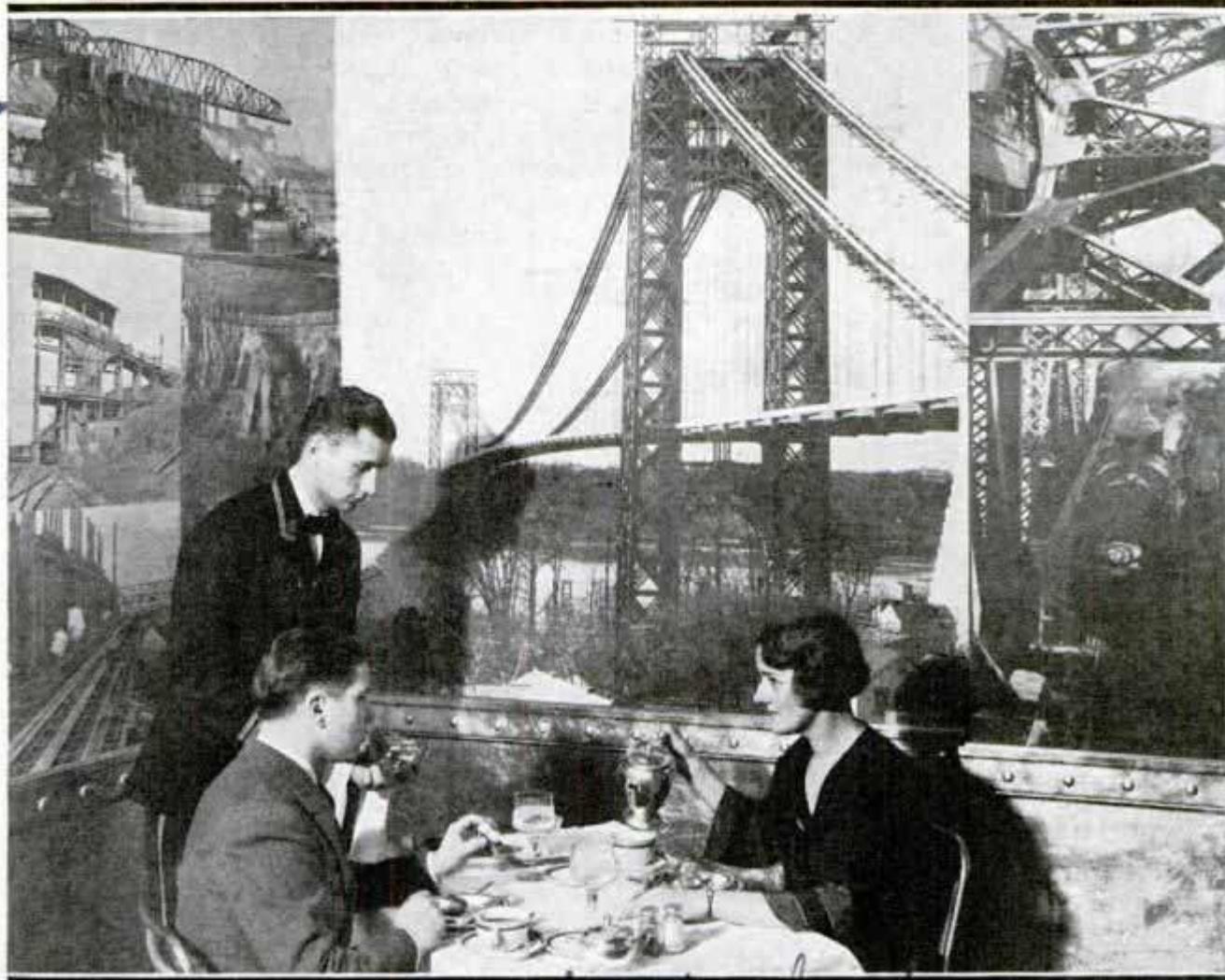
When a wheel is to be raised, the driver turns the indicator on the dial to the position for that wheel, adjusts a button to open a control valve and a second button to throw in the clutch that engages the engine to a pump. The jack does the rest. To release the wheel, the control valve is again opened, the clutch engaged then the procedure is reversed. Each jack is ten and one-half inches long and two



Auto Jacks Mounted Next to Each Wheel and Controlled Individually or Collectively from Dash

and one-half inches in diameter. There are three sizes, two for large and small passenger cars and a third for trucks. In addition to its use for changing tires, the device can also be employed to lift a car out of a rut or to jack it up for storage.

Realistic Story of Steel Told in Photo-Murals



Courtesy Kaufmann & Fabry Studio

425 S Wabash Chicago
This Photograph Gives the Impression That You Are Looking through a Window at a Bridge; Actually, You See a Large Photograph-Mural of a Bridge; It Is Part of Club Decorative Scheme

Interesting scenes in the steel industry, from the mine to finished bridges and buildings, decorate the walls of one room in a Chicago club. The story is told in photo-murals. In a curved alcove at one side, the wall is completely covered with one large mural showing a night scene at a steel mill. So realistic is it that the observer feels he actually is looking through a single pane window at the mill. Special illumination is housed in ceiling fixtures of steel frames.

D 14 78.

MASTER SPEEDOMETER CHECKS AUTO'S INSTRUMENTS

Precision built and very durable, a master speedometer is used easily to check the accuracy of dashboard speedometers on automobiles. It is operated by jacking up

a rear wheel and holding the speedometer wheel in contact with the center of the rotating tire. The surface, or road speed, of the tire is shown in miles per hour on the four-inch dial. One man operates the speedometer and another watches the dash instrument, the readings being compared. The size of the tire has no effect on the accuracy of the test as the instrument is based on the principle that to check a dashboard speed-

ometer, its indicated speed should be compared with the surface speed of the tires.

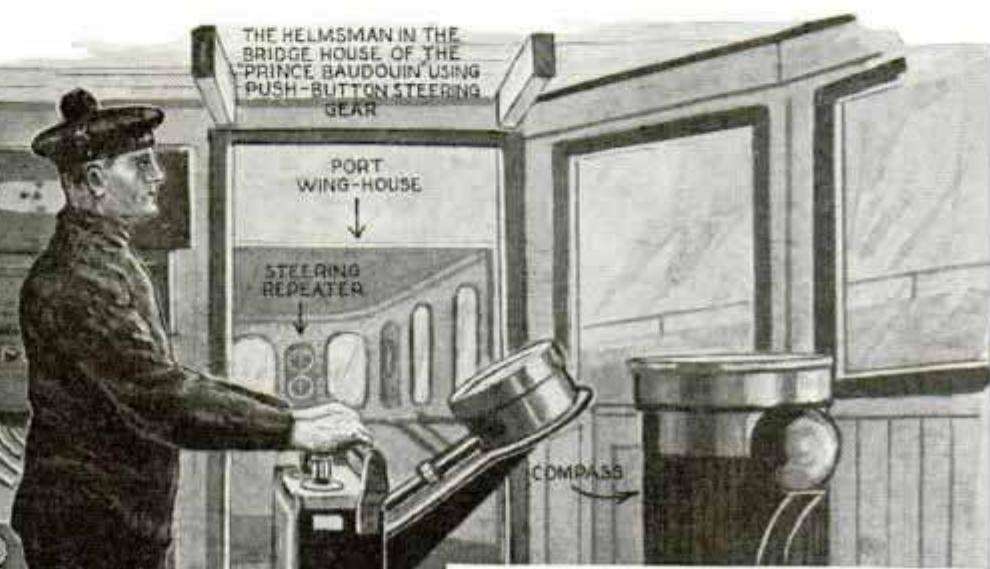


Viking Instruments, Inc. 1938

Push Buttons Replace Wheel in Steering Ship



For two centuries the helms of ships have been controlled by a wheel, but push buttons replace this conventional steering gear on the new 3,500-ton, twenty-five knot motor ship, "Prince Baudouin," plying in cross-channel service between Dover and Ostend. Instead of the wheel, there are two push buttons operated by a gentle movement of the helmsman's hands. In front of the helmsman is a turn indicator, showing the amount of turn to port or starboard as the buttons are pressed. To assist the officer of the watch, repeaters are placed in the two shelters at



Helmsman Steering Ship with Push Buttons Instead of Conventional Wheel, and View of Controls

the port and starboard ends of the bridge. In entering harbor, this ship goes in stern first and a second set of steering gear and push buttons controls this operation. Besides the buttons, the helmsman has within reach the controls for the navigation lights and the water-tight doors, and also listens for the fire-alarm indicator.

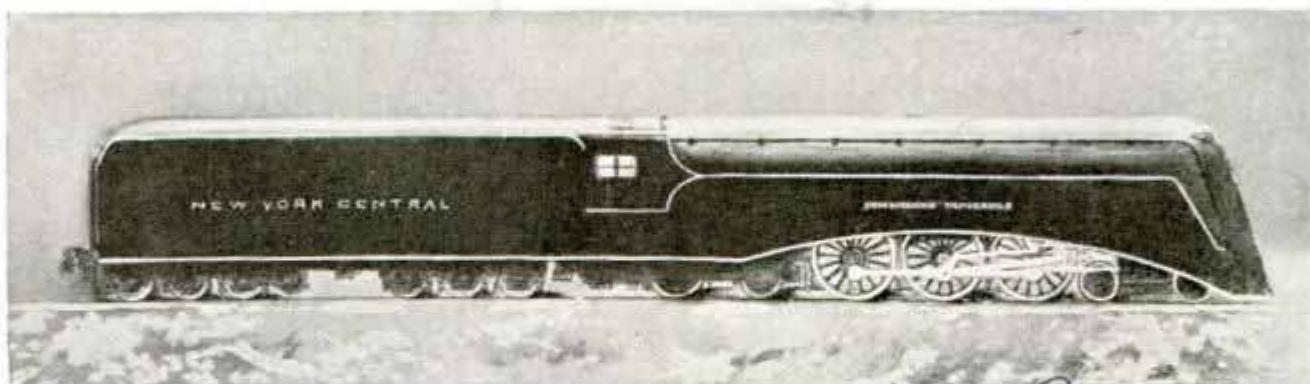
D 1434 Copper-Alloy Cylinder Head Increases Engine Power

More power, less fuel consumption and less formation of carbon are three advantages claimed for a copper-alloy cylinder head for engines. Its development followed experiments based on the belief that the relatively high thermal conductivity of copper and its alloys would tend to minimize the formation of local hot spots, resulting in improved performance. In comparative tests with standard cast iron and

aluminum head engines, the copper head was rated first in fuel economy, less carbon formation and increased power. The tests indicated that the compression ratio of the copper head could be raised safely above 7.1 to 1 with satisfactory results. Two engine manufacturers already have ordered the new head into production for their power units, so favorable were results of the tests.

Federal-Mogul Corp. 11031

Streamline Steam Engine Attains High Speed



Acme
Streamline Locomotive and Tender Designed to Cut Head Air Resistance About Thirty-Five per Cent at High Speed; It Develops More Than 4,000 Horsepower

Most of the streamline trains to date have employed either Diesel or electric power, or a combination of the two, but the New York Central railroad now has a streamline steam locomotive for passenger service. It is estimated the streamlining, which makes the locomotive and tender one sleek, unbroken unit, cuts head air resistance about thirty-five per cent at a speed of seventy to ninety miles per hour. The engine develops 4,075 horsepower and is named the Commodore Vanderbilt.

and one-half inches long, is attached to the standard bolt handle with a screwdriver. If has a socket which fits over the regular handle and is held in place with three screws. In action the left hand readily grasps the projecting knob and works the bolt-action with the same accuracy and speed as the right-hand shooter. There is one model for the straight bolt lever and another for the curved one. The sights are

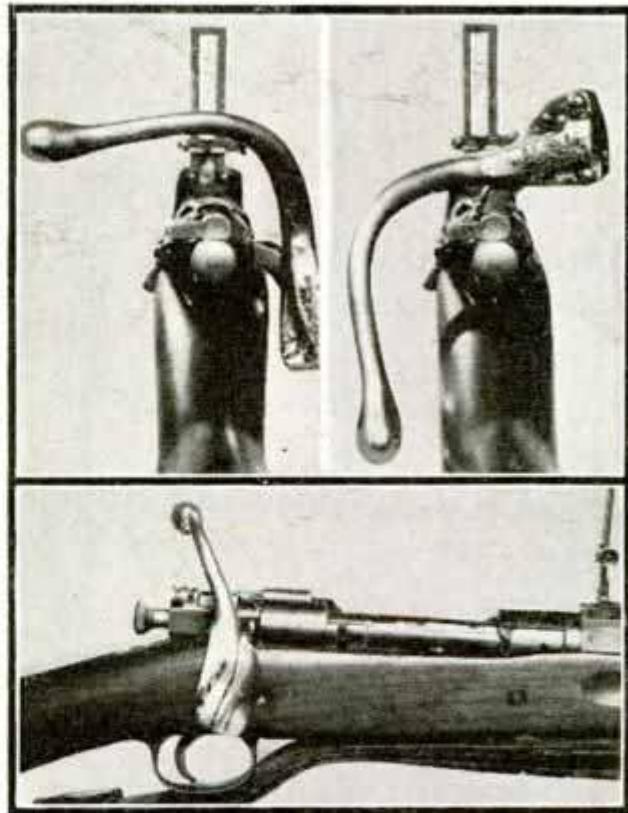
D 1491
GLASS HEADS LIGHTED INSIDE AS ADVERTISING IDEA

Glass model heads, illuminated inside, are among the latest ideas in the advertising field. The light from an electric bulb shines through the glass to give a life-like appearance to the head. The illuminated models are used to advertise hats, earrings, eye glasses, ornaments and other things.



D 1483
BOLT HANDLE ADJUSTS RIFLE FOR LEFT-HAND SHOOTING

Left-handed shots who have trouble with the bolt-action rifle can have their favorite 30-30 Springfield or Krag gun transformed into a real left-handed firing arm with the aid of a special bolt handle. The auxiliary handle, a curved lever seven



Acme
Handle for Bolt-Action Rifle Which Adjusts the Gun for the Left-Handed Shot

not interfered with as the curved lever clears the receiver sufficiently to permit an unobstructed view beneath it.

H. E. Wale Brewerton,

1459

% James. Los Angeles City

DOUGLAS Tells



By DONALD W. DOUGLAS

President, Douglas Aircraft Company, Inc.

WHEN a bi-motored transport streaked eastward from Los Angeles to New York in thirteen hours, four minutes, twenty seconds, it sounded the death knell of three-engine construction in commercial aviation and boosted transcontinental transport flying speed 100 miles an hour.

The flight distance of 2,609 miles demonstrated that today it is both safe and feasible to fly over vast ocean stretches, using modified land airplanes. The trip from California to Hawaii is 2,200 miles. The span from Harbor Grace to Ireland is but 1,800.

Since that epochal flight last February, records continue to fall. Only last November Capt. Eddie Rickenbacker, flying with



Instrument Board of Douglas Transport, and Donald W. Douglas, Left, with K. D. Parmentier Who, with J. J. Moll, Placed Second in Handicap Section of London-Melbourne Air Race, Using Douglas Plane

tal and Western Air, Inc., now T.W.A., came to us over a year ago with an order for more than forty airplanes, they wanted transports to cruise at 160 miles an hour, a top speed of 187 miles an hour or more. Also they asked us to meet these specifi-

T.W.A.'s senior pilot, "Si" Morehouse, clipped the transport time from Los Angeles to Newark to twelve hours, three minutes, fifty seconds in another Douglas. Then Capt. Rickenbacker carried thirteen passengers on the first one-day round-trip flight for an air liner between New York and Miami in the same ship. On the return run to New York the airplane chopped four hours, twenty minutes from the previous transport record by negotiating the 1,195 miles in one minute over seven hours.

When Transcontinen-

SECRETS of SPEED



cations without seeking speed through lightness at the expense of slashed pay-load capacity.

It cost us \$325,000 to produce DC-1, the Douglas transport of the February run. With that background, we turned to constructing DC-2, the speed ship of last November. We can produce the DC-2 type ship commercially today at approximately \$80,000.

There was no way to accomplish these results by simply increasing power. We had to tackle minute elements of fuselage design and all the refinements in aircraft engineering. Combating wind resistance became an immediate objective with absolute streamline the goal. Wind-tunnel tests proved you cannot get full streamline with a tri-motored plane, because one of the engines



The Nose of a Douglas Transport, and Fuselage Assembly Room of Douglas Aircraft Company Factory

must go on the nose. Other experiments found the efficiency point for trimming flaps, established proper design for the engine cowl, and checked for the most successful type of fillet. We used three complete sets of wings and made several radi-



cal departures even in landing gear. Drawing up the landing gear cuts wind resistance to the point where you gain approximately twenty-five miles an hour over any other arrangement thus far devised.

Another factor we used to gain speed was developed by the National Advisory Committee for Aeronautics. We place the nacelle which carries each engine so that each propeller is on the center line with the wing. This cuts the wind resistance of the nacelle.

To further the streamline idea, we used a smooth sheet

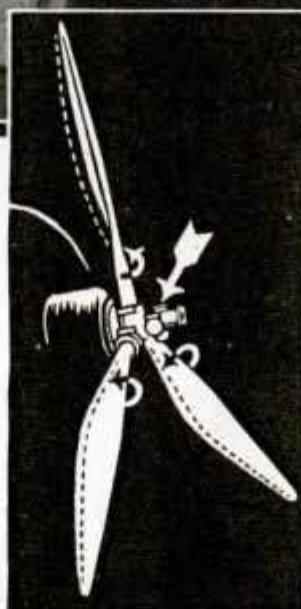
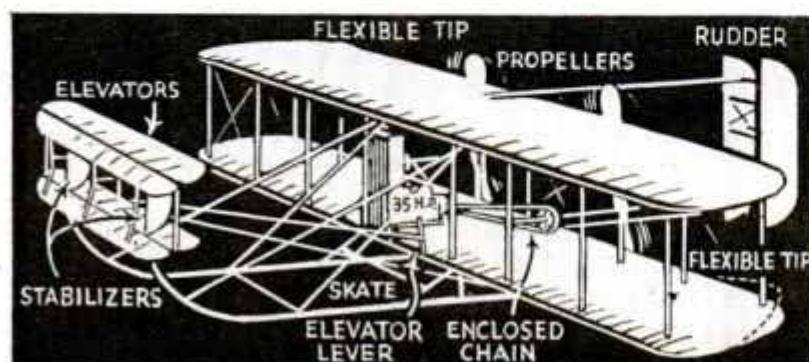


Diagram Shows Action of Controllable Pitch Propeller; Arrow Indicates Gears Which Change Pitch



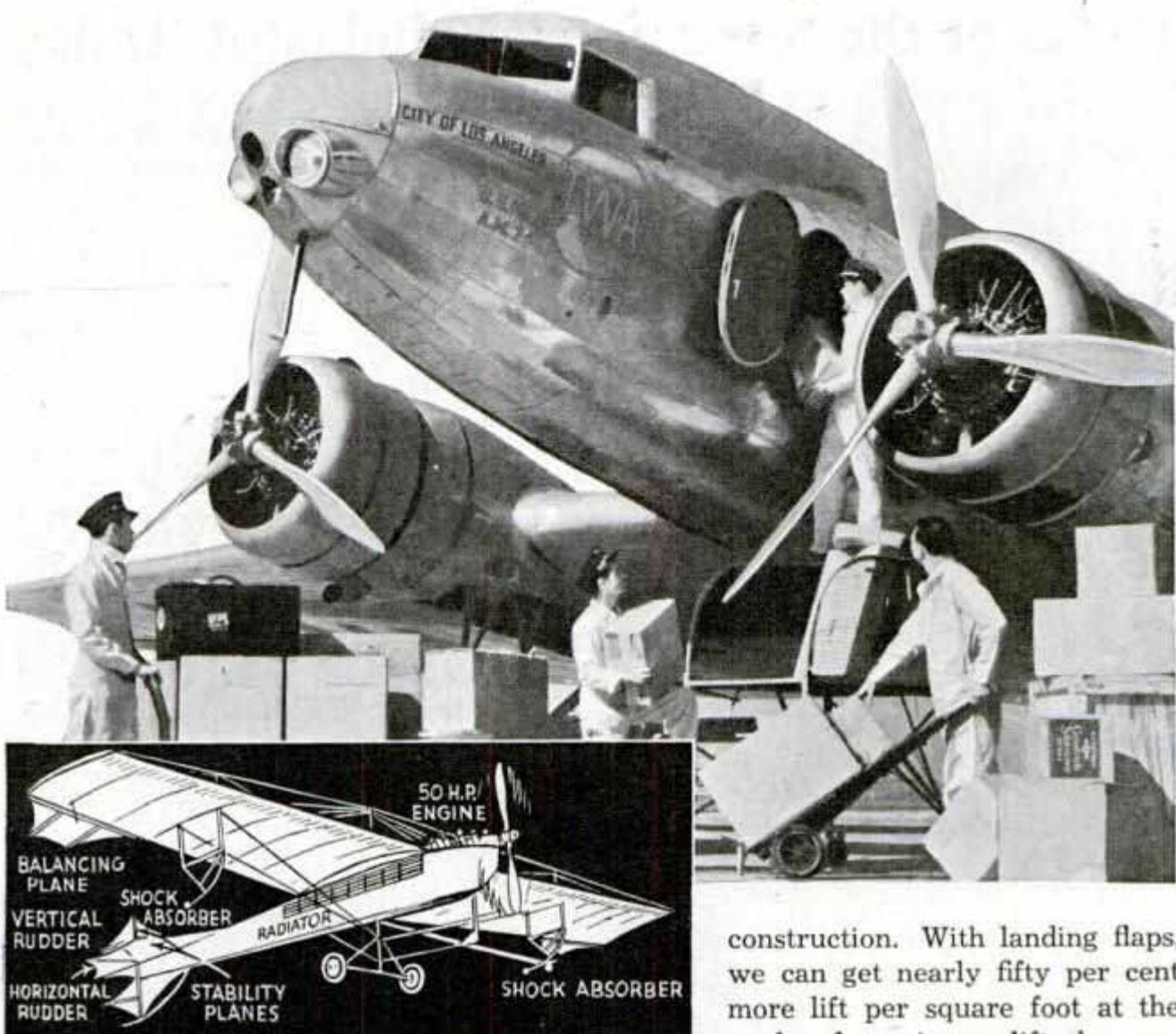
Evolutionary Wright Biplane with Flexible Wing Tips; Above, Interior of De Luxe Douglas Transport

with generous fillets instead of sharp corners. If you work with metal skin instead of fabric you can attain any shape you desire. With the old fabric system the "formers" underneath offered restrictions of their own which could not be overcome.

The metal we used is duralumin. This is coated with pure aluminum on each side to thickness approximating five per cent of the thickness of the sheet. This makes the wing skin into a sort of a sandwich. The aluminum coat has such resistance to corrosion that additional paint is unnecessary for land airplanes not operating in a sea area.

The fillets are the covering for the wing-root of an airplane, molding the wing into the fuselage. If they are generous and well-rounded you get less wind resistance than if they are square or angular.

Another source of additional speed is the supercharged motors. Because air conditions vary at different altitudes and



Loading Douglas Transport, and a 1907 Monoplane, Showing First Application of Ailerons or "Balancing Plane"

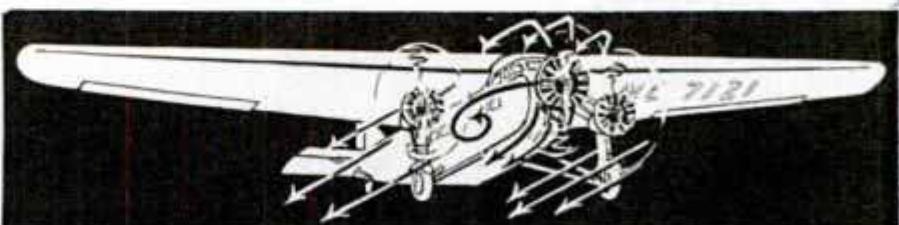
no single propeller adjustment gives maximum efficiency in all, we used propellers of adjustable pitch so the angle can be changed while in flight to conform with the density of the atmosphere.

When we start out to build an airplane, we plan the cabin first and then build the airplane around it. From the cabin you determine the size of the fuselage. The rest of the airplane is worked out accordingly. The actual wing area depends upon the landing speed. In turn, that landing speed hinges upon the maximum lift which the wing will support in pounds per square foot. That maximum comes at a particular angle that cannot be specified arbitrarily because it varies with different types of

construction. With landing flaps, we can get nearly fifty per cent more lift per square foot at the angle of maximum lift than we can without flaps. This means we can reduce the wing area just that much and the less the wing area the less the wind resistance and the greater the potential speed.

The flaps on the Douglas transport connect at the lower surface of the trailing edge of the wing so they drop downward at about a forty-five degree angle. They extend from the inner end of one aileron to the inner end of the other. These flaps are operated hydraulically as is the landing gear, both devices working from the

(Continued to page 127A)



A Tri-Motor Transport with Lines Indicating Slipstream from Three Motors and Showing Why Nose Motor Is Less Efficient Than Others

D 1343
216

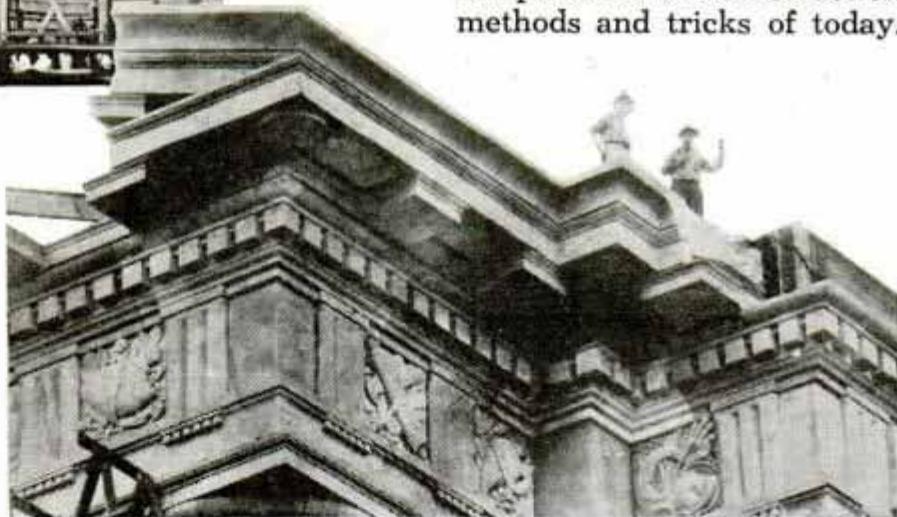
POPULAR MECHANICS

Cleveland, Ohio

Tricks of the "Pyramid" Builders of Today



Top, Hoisting Giant Block of Stone; Bottom, Huge "Kneelers" in Place on Government Building; These Construction Methods Are Far More Remarkable Than Those of the Ancient Pyramid Builders



While some construction projects of ancient governments often are regarded as almost super-human, the modern builder is not over-awed. For instance, the United States government has just completed a group of buildings in Washington, D. C., that offered some unusual problems. One of the group, the Auditorium building, has a triangular carved roof of solid stone supported by six massive columns. The overhanging cornerstones, called "kneelers," weigh fifty-five tons each. Two special derricks and a system of turnbuckles were utilized to raise these huge kneelers. The three buildings in the group, containing 58,639 tons of stone, were erected in 265 days. Feats of the ancient pyramid builders, who had plenty of time and vast quantities of slave labor at their command, almost dwindle into insignificance when compared to the construction methods and tricks of today.

Con. James Portland Cement Co., Cleveland, Ohio

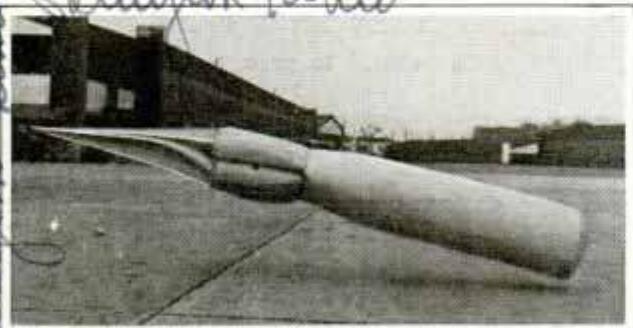
7

Con. James Portland Cement Co., Cleveland, Ohio

D 1506

Air Target Towed by Plane Used for Gunnery Practice

Capable of being towed by an airplane at a speed of 200 miles per hour, a new type of aerial target, twice as large as those



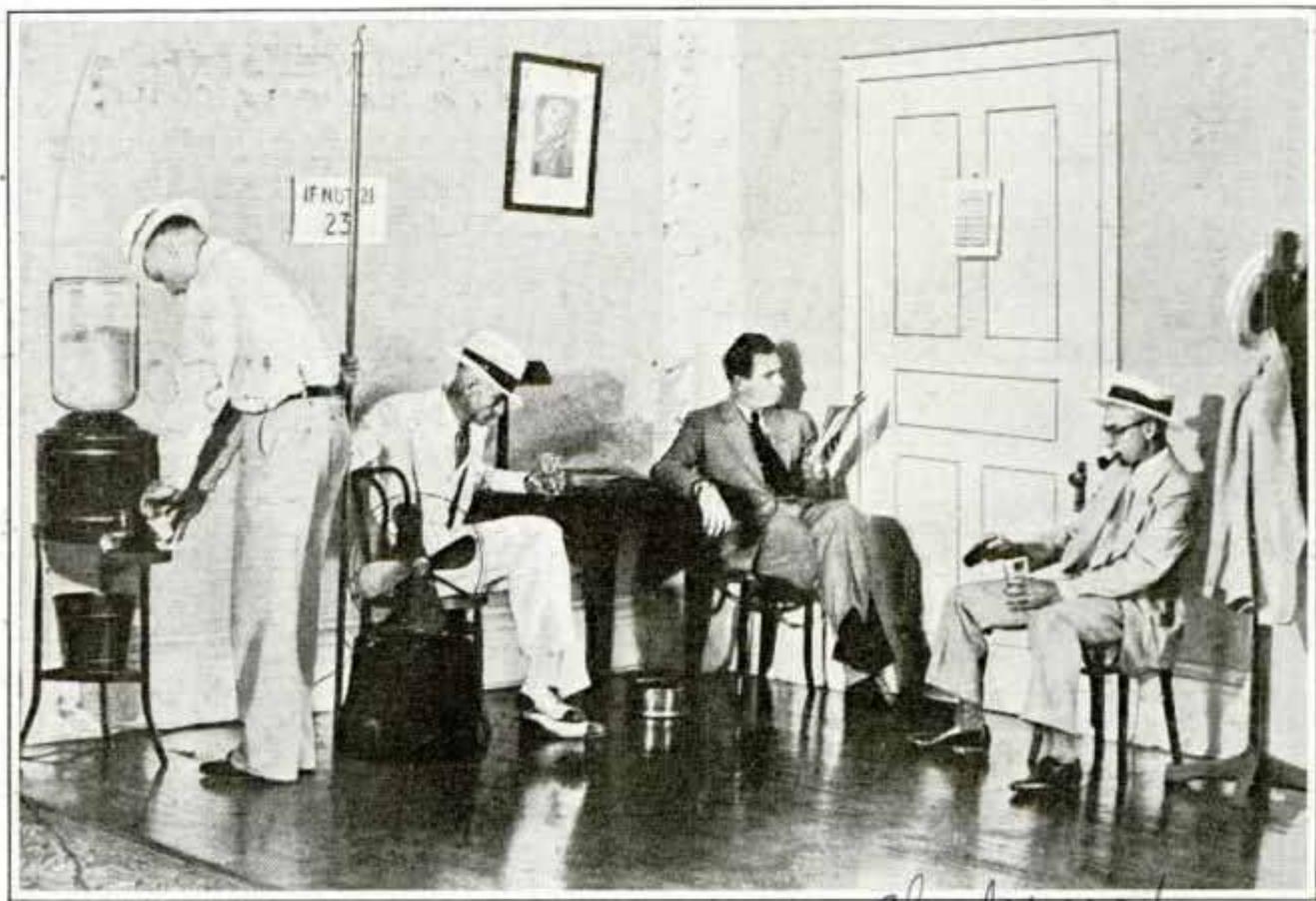
One of the New Type of Aerial Targets Towed behind a Plane for Anti-Aircraft Gunnery Practice

heretofore used, has been developed for gunnery practice. The new target is of sleeve construction, with a series of smaller sleeves honeycombed inside the larger. The rear end is partly closed by a draw string, and in this way nearly all resistance except frictional drag of the fabric is eliminated. It is inflated by the slipstream of the propeller and as many as ten targets can be carried in the rear cockpit of a ferrying plane. The targets are towed behind the plane at a distance of from 600 feet to one-half mile and when one is hit, it is reeled in and another one is reeled out to replace it.

at Wright Field, Dayton, Ohio

Con. Charles J. Bauer
Co. of Dayton, Ohio

Study This Photo and Test Your 'Horse Sense'



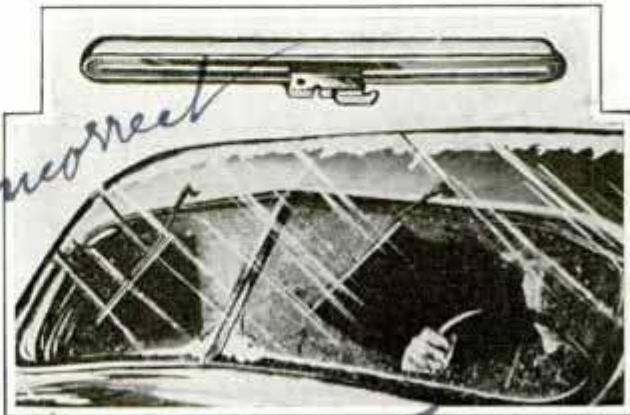
International
After Studying This Picture Closely for Five Minutes, Turn to the Following Page and, without Referring Again to the Photo, See if You Can Answer the Questions Concerning It

Have you ordinary "horse sense"? The government used this photograph to test the horse sense of 900 former prohibition inspectors who were required to pass a civil-service examination before being transferred to other work. The picture was intended to test the powers of observation of the applicants. They were asked to study the picture closely for five minutes, then spend no more than thirty minutes answering twenty-five questions

concerning it. A large percentage failed to pass and many contended that the test was unfair. If you want to test your own powers of observation, study the photograph until you think you can visualize every detail, then turn to the following page and, without again referring to the picture, try to answer the questions, part of the list which the applicants were asked. When you have finished, refer again to the photograph and check your answers.

Chemical in Blade of Wiper Melts Ice on Windshield

Attached to the arm of the windshield wiper in place of the usual rubber strip, an automatic defroster prevents water and snow from freezing into ice on the glass. It consists of an absorbent material attached to a metal strip. The absorbent contains a chemical which generates heat when water comes in contact with it. This heat melts the ice or prevents the water from getting cold enough to form ice. It is installed by removing the rubber wiper and attaching the defroster in its stead.



The Sleeter Co.

*One 404 Fourth
Main St.*

218

50 Ashland St. BOSTON

POPULAR MECHANICS

D 1504 Everett Mass
SWIVEL HEAD BOLT CLIPPER
WORKS AT MANY ANGLES



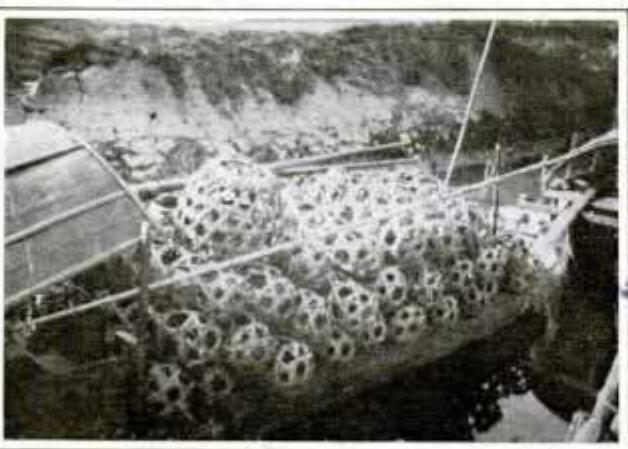
A detailed black and white illustration of a traditional Chinese straight-bladed sword (jian). The sword features a long, straight blade with a slightly upward curve at the tip. The hilt is ornate, with a large, bulbous guard (tianya) and a pommel (teng) decorated with intricate patterns. A leather scabbard (kao) is shown sheathed in front of the hilt. The background is plain white.

*Tool for Clipping Bolts, Shown in Several Positions,
May Be Used at Many Angles.*

Designed with a swivel head that permits work at many angles, a new bolt clipper speeds up work. It works equally well up or down, right or left, behind or before, in or out, because the cutting head swivels to any angle on either side of the handles. The tool will hold any standard head of a given size, clipper cut, center cut, chain cutter, nut splitter, etc., and the change from one head to another can be made quickly.

**LIVE PIGS SHIPPED IN BASKETS
TO SAVE CARGO SPACE**

In order to save space in shipping, small live pigs are being sent in baskets for long



These Baskets Contain Small Live Pigs Which Are Shipped in This Manner to Save Space

distances in south China. By placing them in the baskets, large numbers can be piled in a comparatively small space and the porkers can be handled like any inanimate units of merchandise.

HIGH-EFFICIENCY CARBURETOR GIVES BETTER PICK-UP

Remarkable increases in performance are claimed by a replacement downdraft carburetor designed for maximum efficiency. The carburetor has a three-stage setting and the increase in power and pick-up is very noticeable at speeds from zero to forty miles per hour. The float chamber is centered, giving the proper flow of fuel on curves and hills, as well as on the level straightaway. Made of brass, the carburetor is protected against corrosion.

\$17.50



“Horse Sense” Questions

(See preceding page)

Name at least two items indicating the season of the year.

What articles of clothing, not being worn, are shown?

Do these articles of clothing appear to belong to the same man? Why?

How many pictures are shown on the walls of the room?
Which man wears the darkest colored suit?
Could the bareheaded man reach his hat from his position in the picture?

How many of the men are standing?

How many of the men are standing?
Which man is shown farthest from you?
Are there enough chairs for the group?

Are there enough chairs for the group?
Which, if any, of the men presents a full face view?

Is the man wearing the stiff straw hat?

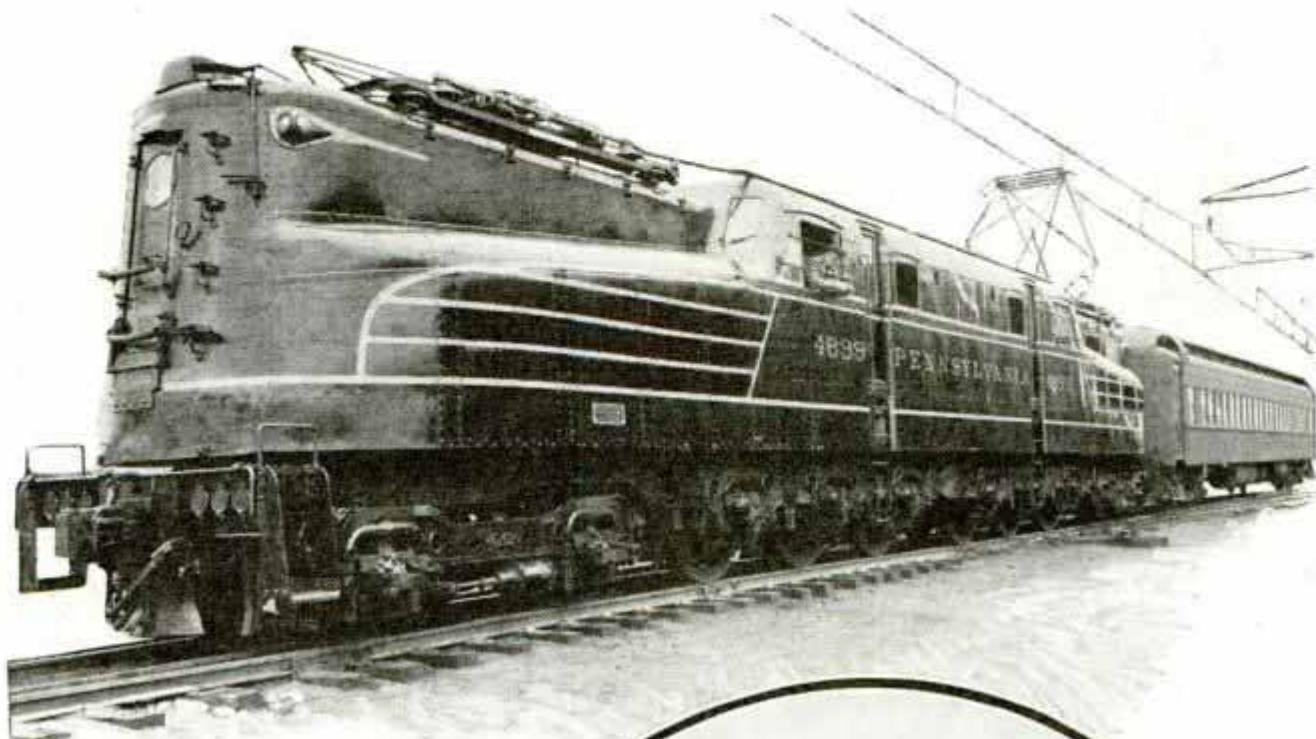
What electrical fixtures are shown?

What electrical fixtures are shown?
There is a revolver shown. From their positions in the picture, could the bareheaded man seize it more quickly than the man

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

Y1497
Conv. George R. Cukanar,
2047 North Park Ave.
Philadelphia, Pa

The LATEST in LOCOMOTIVES

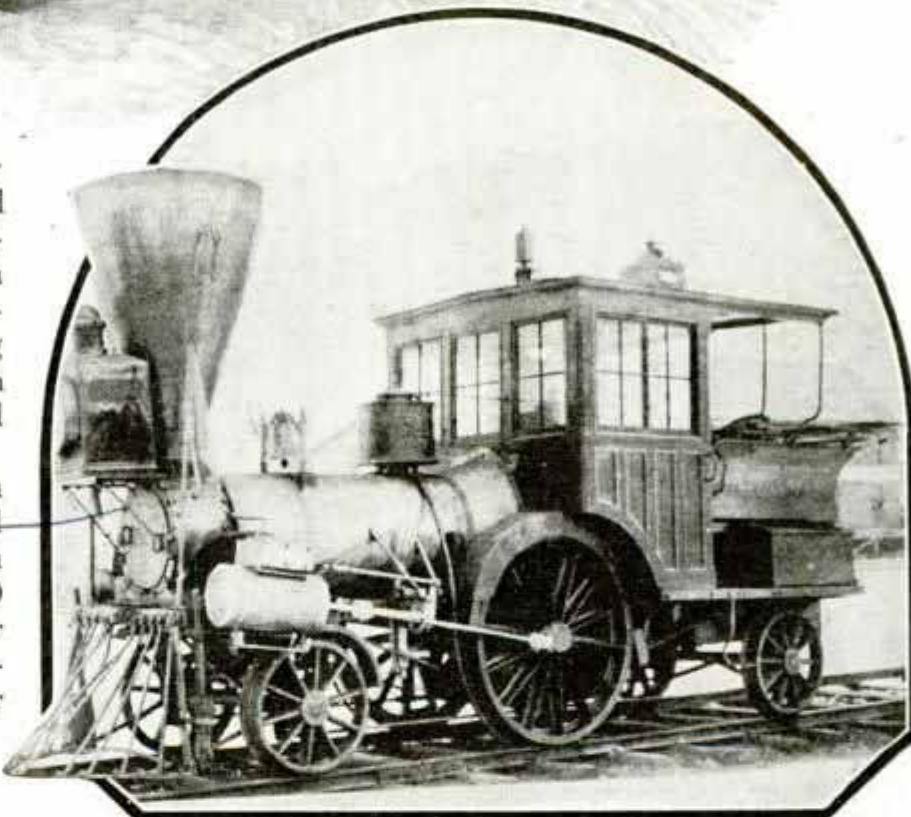


GIANT electric super-locomotives, designed to meet the public's demand for more speed in all forms of transportation, soon will be hauling passengers between Washington, D. C., and Philadelphia.

This stretch of track on the Pennsylvania railroad is one of the busiest in the world, handling 830 trains every twenty-four hours. Faced by the problem of running faster trains at more frequent intervals to carry the heavy traffic, officials of the line finally adopted the new locomotive as the answer.

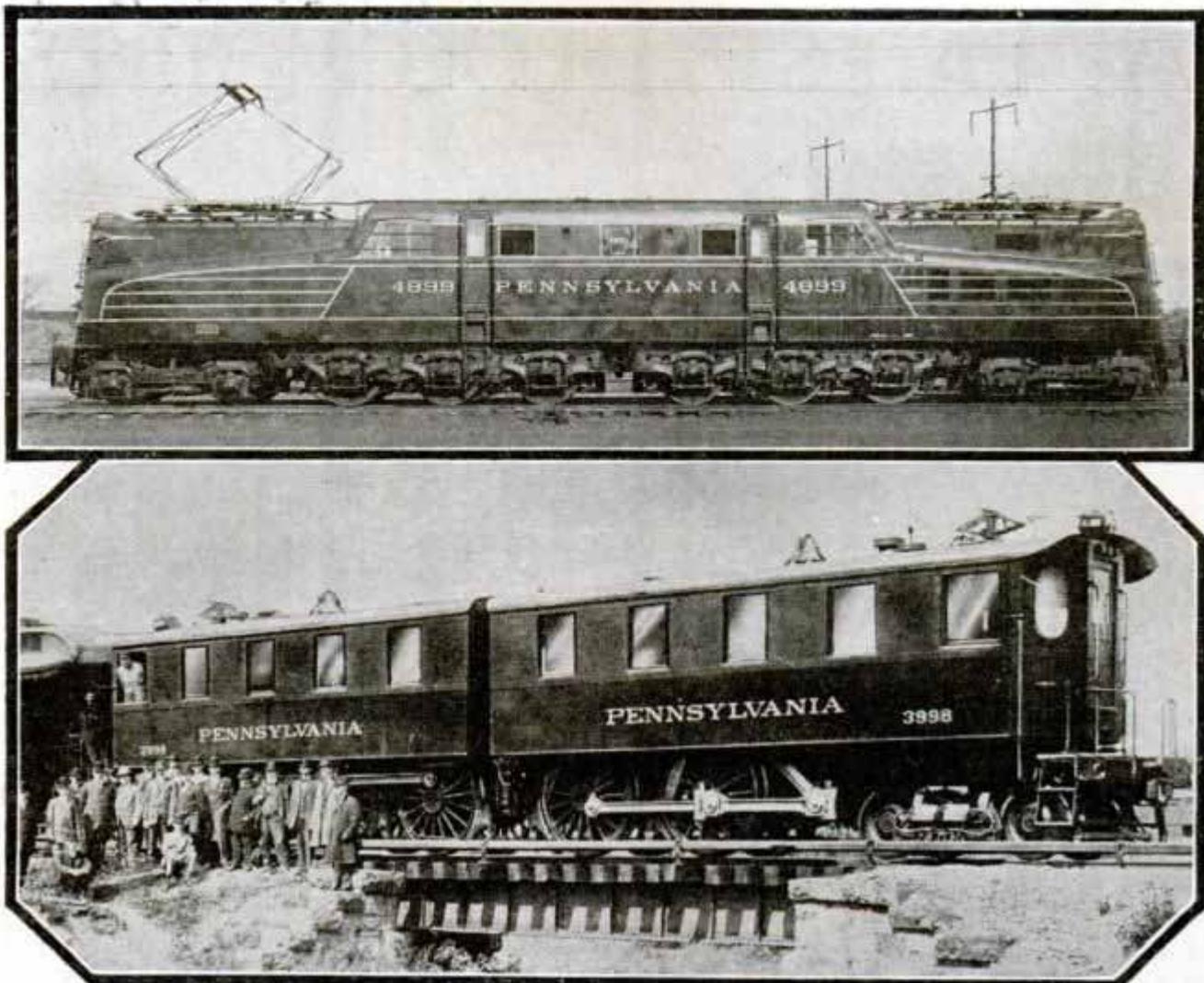
Electric current is taken from overhead wires to drive the big engine at a normal operating speed of ninety miles per hour. It and others in the fleet will pull standard steel coaches of any number necessary to handle the traffic normally carried between the two eastern cities.

The new engine has twelve fifty-seven



The Ancient and the Modern in Iron Horses; Above, the Newest High-Speed Electric Locomotive; Below, Pioneer of Cumberland Valley

inch driving wheels, six on each side, and develops 4,620 horsepower. Seventy-nine and one-half feet long, the locomotive is of all-steel construction and weighs 460,000 pounds. The maximum starting tractive effort amounts to 72,800 pounds, with the power supplied by six pairs of twin ignition motors, each pair attached to a driv-



The Development of the Electric Locomotive Is Illustrated by These Pictures of the Latest Type of Streamline Engine and the Very Earliest Type, Used about 1910

ing axle. Power is transmitted to the driving wheels through quill-mounted gears, permitting a free spring play of axle and wheels. Two main frames, each resting on six driving wheels and a four-wheel engine truck, joined by an articulated or hinged joint, support the body.

Each end of the new locomotive slopes gently inward from the floor to the cab roof with rounded shoulders running toward the central operating compartment. The engineer's control position is located at the center of the cab, giving an unobstructed view of the track. This type of construction is pleasing to the eye and in line with the modern trend toward streamlining. But with its mighty electric motors, the engine depends upon its power, rather than any factor of design, for its performance. All low-voltage signal, telegraph and telephone lines are placed in underground conduits to eliminate interference from the high-voltage circuits used

by the big electrics. Because of improved acceleration, increased train speeds, more uniform speeds, operation of longer trains and the even spacing of trains, electric locomotives increase the ultimate capacity of a trackage by twenty-five per cent without any increase in track mileage. Unit for unit, the electric costs more than the steam locomotive, but because of greater tractive effort and fewer hours of idleness for maintenance, a smaller number of electric engines is necessary for handling a certain amount of traffic.

The development of the electric over its thirty-nine years of existence has been almost as dramatic as that of the steam locomotive. The engine used before the introduction of the super-electric had three pairs of drivers, each seventy-two inches in diameter. It was sixty-two feet eight inches long, weighed 375,000 pounds and developed 3,000 horsepower. Its speed was fifty-six miles per hour. A lighter

electric also was made. It had two pairs of drivers and developed 2,120 horsepower for a speed of fifty-six miles per hour.

While some railway systems have turned to the streamline train of aluminum or stainless steel, the Pennsylvania will use the electric locomotive because of the greater flexibility of service. Where the electric can, and often does haul 1,000 passengers, adding coaches as needed, the streamliner carries only about 150. Too, the unit construction of the streamliner is said to make it difficult to turn around at the end of the line, some types requiring a curved track. Officials of the line point out that while the streamliner probably is an excellent means of long-haul transportation for a few passengers, it is not regarded as the best method of handling the heavy eastern traffic.

D 1468

GOLF LINKS VACUUM CLEANER SWEEPS FAIRWAYS

Fairways of a Seattle golf course have been kept clear of fallen leaves by a machine that operates on the vacuum cleaner principle. Drawn by a tractor, the



Outdoor "Vacuum Cleaner" Shown Collecting Leaves from Golf Course; It Is Tractor-Towed

machine sucks up leaves and other light-weight trash as it moves over the fairways, leaving the course ready for play.

¶ "Pocket battleships," the 10,000-ton armored vessels now favored by many world powers, cost about \$20,000,000 each.

W. W.



Wheeled Carriage Supports Rock Drill in All Positions So One-Man Operation Is Possible

CARRIAGE ADAPTS ROCK DRILL TO ONE-MAN OPERATION

One man is enabled to handle a rock drill at any angle by a carriage that consists of a framework with two steel wheels at one end and steel pins at the other to hold it in position. A universal arm extending upward from the frame holds the drill, hose and accessories. This arm can be swung into practically any position, making it possible to hold the drill vertically, horizontally and obliquely at any angle. The carriage works well on steep formations or other difficult positions.

D 1482 CASE EJECTS CALLING CARD WHEN SLIDE IS PUSHED

Calling cards are protected from dirt and soiled fingers and are produced singly without fumbling in a pocket or container if they are kept in a case which ejects a card each time a slide is pushed. The case is of metal and leather.

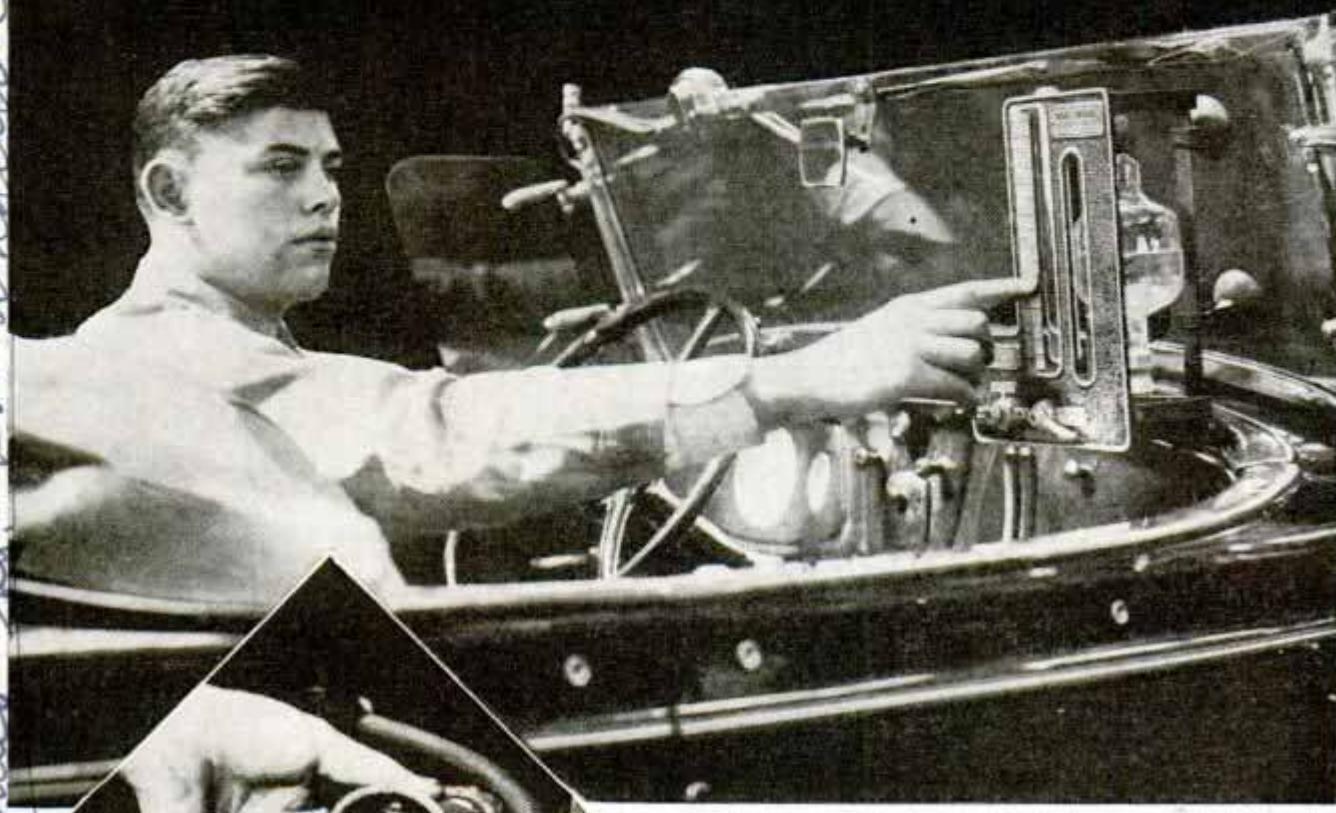


Zip Card Case G.
10.70

Washington Engineers + Machinery Corp. Washington Ave. Hartford, Conn.

D1323

Secrets of MORE



Elmore Oil & Gasoline Co.
7/22 1934
Bell & Howell

FIFTY per cent of motorists throw away nearly half the fuel they pour in their gas tanks. That sounds like a rash statement but it comes from an expert at squeezing every mile he can from a gallon of gasoline.

Last summer Austin Elmore, nationally known test engineer, stopped at a San Francisco telegraph office and checked in at the end of an economy run from Los Angeles. When officials broke the seals and measured the fuel remaining in the tank of his stock eight-cylinder car they found he had averaged 33.3 miles per gallon between the two cities and driven at an average speed of thirty-two miles an

Fuel Reservoir on Windshield to Show How Rapidly Poor Driving Consumes Gasoline and, Left, the Distributor Is a Common Source of Poor Mileage

hour for the 443 miles. Newspapermen trailed him on an official run to Sacramento, measuring his gasoline themselves. To their amazement their own figures showed Elmore had averaged thirty-five miles to the gallon.

"What's the secret?" demanded a crest-fallen reporter whose car, trailing right behind, had used a couple more gallons on the trip. "Good driving habits," Elmore responded, and explained that a well-trained foot on the accelerator can make a car go farther on less fuel.

When an irate motorist complains about his mileage Elmore is often detailed to check the trouble. He knows before he starts that the driver, instead of the car, is probably at fault but that's one thing no driver likes to be told. With the owner behind the wheel driving the way he is accustomed the car is driven across the city. Then the gasoline that was used is accurately measured and Elmore drives back over the same route. Elmore arrives

MILES per Gallon



Demonstrating Detonation in Gasoline-Vapor Filled Glass Tube; When Match Is Applied to Open End and Tube Is Closed, Flame Travels Slowly Down Two-Thirds of Tube, Then Ignites Rest of Fuel in One Flash

back in less time and having used less gasoline! In seventy-three cases of poor mileage complaints, Elmore got twenty-seven per cent better mileage out of the cars than the owners did, the individual figures ranging from eleven to forty-one per cent.

Next the economy driver shows the owner just where the trouble is. A "mileage vizometer" consisting of two accurately graduated fuel reservoirs is attached to the windshield of the car. When the owner throws the gears into second and "romps on it" he sees the fuel drain out of the glass reservoir almost by magic. Then after refilling the reservoir, Elmore shifts into second. This time the car picks up speed nearly as fast but half the fuel still remains in the graduated tube.

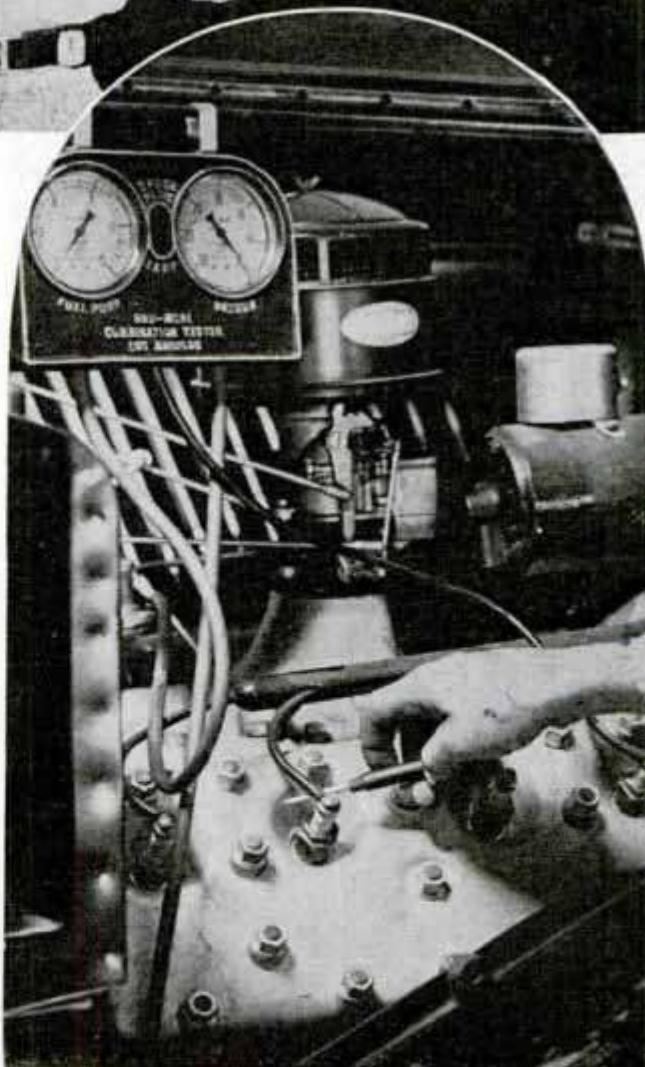
"When you wanted to make a fast getaway you pressed the throttle clear down to the floor, giving the engine more gasoline than it needed for maximum power,"

(Continued to page 136A)

AVERAGE MILEAGE AT DIFFERENT SPEEDS

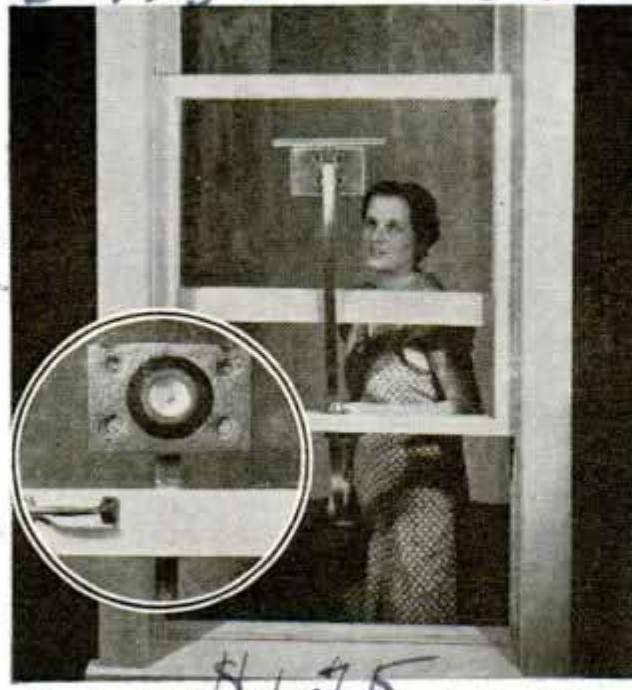
The following information is the result of tests to show how various driving conditions cut down miles per gallon. For example, a car capable of giving twenty miles per gallon at twenty miles per hour will increase its gasoline consumption at higher speeds as follows:

Miles per Hour	Miles per Gallon
20	21.2
30	20.7
40	19.1
50	17.3
60	14.2
70	11.8
80	9.0



Testing the Spark Plugs and also Registering Efficiency of Fuel Pump and Vacuum

D 1432



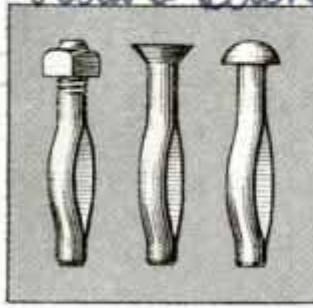
\$1.75
Cleaning Outside of Window From Inside of Room,
and Washer Which Makes It Possible

OUTSIDE OF WINDOW WASHED FROM THE INSIDE

Much of the hard work involved in cleaning windows is eliminated by using a window washer which cleans the outside but is operated from the inside. It consists of a flexible metal handle to one end of which is attached a frame holding a sponge rubber pad. In the center of the pad is a suction cup which holds the pad against the glass for washing. The pad is removed by using a wire hook to break the suction. For drying and polishing a squeegee is attached to the top of the washer, the squeegee operating only on the down stroke. Intended primarily for cleaning the outside of windows, the device can be used equally well for the inside.

D 1524

BOLT EXPANDS IN CONCRETE TO ANCHOR FIXTURES



For anchoring fixtures to concrete, brick, stone and other solid masonry, a new bolt with a spring-like body expands as it is driven, resulting in great holding power.

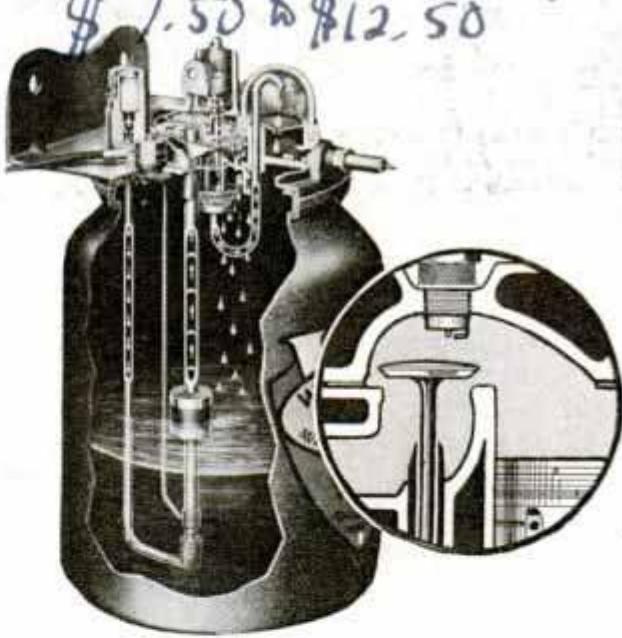
The bolt is easy to use. A hole is drilled in the material, the fixture set in place and

the bolt is driven in with a few blows of the hammer. The holding power is obtained by unusual construction of the bolt, which has a body sheared through the center. In the same operation, each side of the shear is deformed in opposite directions, the result being an outward bow. As the bolt is made of high carbon steel treated to get spring properties, this bow forms a spring tension when the bolt is driven into the hole. The anchoring device is made with several style heads, round, countersunk and stud. The stud head permits removal of fixtures at any time without disturbing the bolt.

D 1471

LUBRICATOR FOR UPPER ENGINE HAS AUTOMATIC THERMOSTAT

Positive lubrication of the upper engine is accomplished by a gravity-operated device with an automatic thermostat. The lubricator feeds the oil to the upper engine through the intake manifold. The same quantity is introduced irrespective of temperature conditions from forty de-



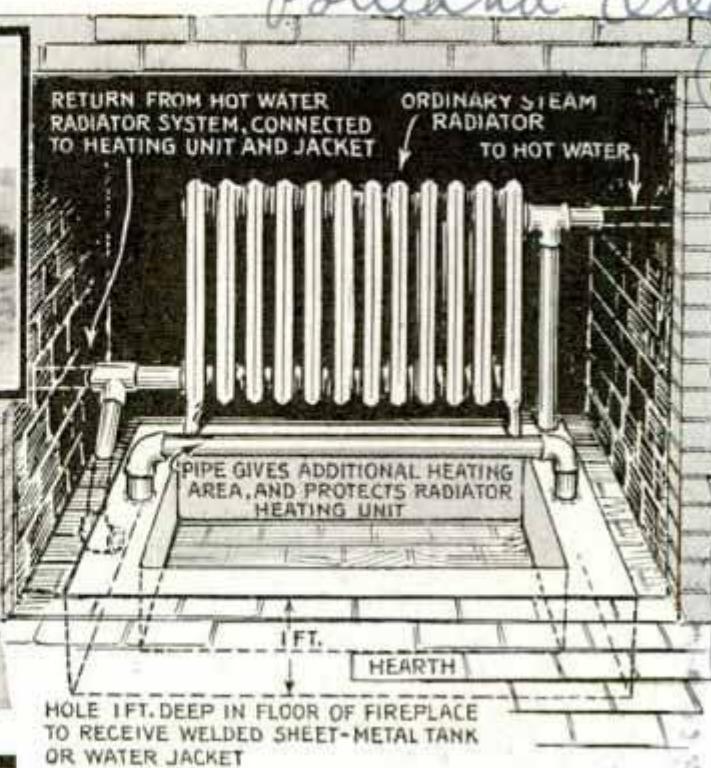
\$1.50 to \$12.50
Automatic Lubricator for Attachment to Engine; In-
sert, Part of Engine It Lubricates

rees below to 300 degrees above zero. The lubricator provides positive feed for all vacuum changes and increases the oil feed as the engine vacuum drops due to greater load. An initial "shot" of oil is delivered automatically when the engine is started cold, thus helping to prevent scuffing of parts resulting from failure of crankcase lubricant to reach these parts promptly after starting.

*The Rawl plug Co.
98 Belmont Rd., Chicago, Ill.*

*Joseph Weidenhoff
4344 Randolph St., Chicago, Ill.*

Heating Plant in Fireplace Warms the House



Top, Home Heated by Fireplace Plant; Bottom, Close-Up of Coils; Right, Drawing of the Plant as Installed in One Home; Note Simplicity of Connections to Existing Hot-Water System

Operated in connection with the usual system of hot-water radiators, fireplace heating plants are being used to heat entire houses in the far west. The arrangement eliminates the boiler in the basement. After the bottom of the fireplace is excavated to a depth of twelve inches, it is lined and made level with the floor by installing a welded, sheet-metal water jacket in the shape of a hollow rectangle with a

cross-section four by twelve inches. In the rear of the fireplace is mounted an ordinary steam radiator connected to the hot-water system throughout the house. The hot water passes through the radiating system and returns to the water jacket and the radiator heating unit. The cost of heating the entire house is said to be little more than that required to operate only as a fireplace.

Boundary Light for Airport Is Operated by Dry Battery

For airports without electric current, a boundary light has been developed which is operated by a single dry-cell battery. The battery, it is claimed, will illuminate the light for six months without replacement. The unit is constructed of Bakelite and is so built that a plane striking it will break it from its base. A highly reflective tip and conical transparent body assure efficient illumination, making the light visible from a plane at a distance of five miles. Where it is available, electric current also can be used with the light, and a model which will float on water has been designed for anchoring in harbors to designate landing spaces for flying boats.

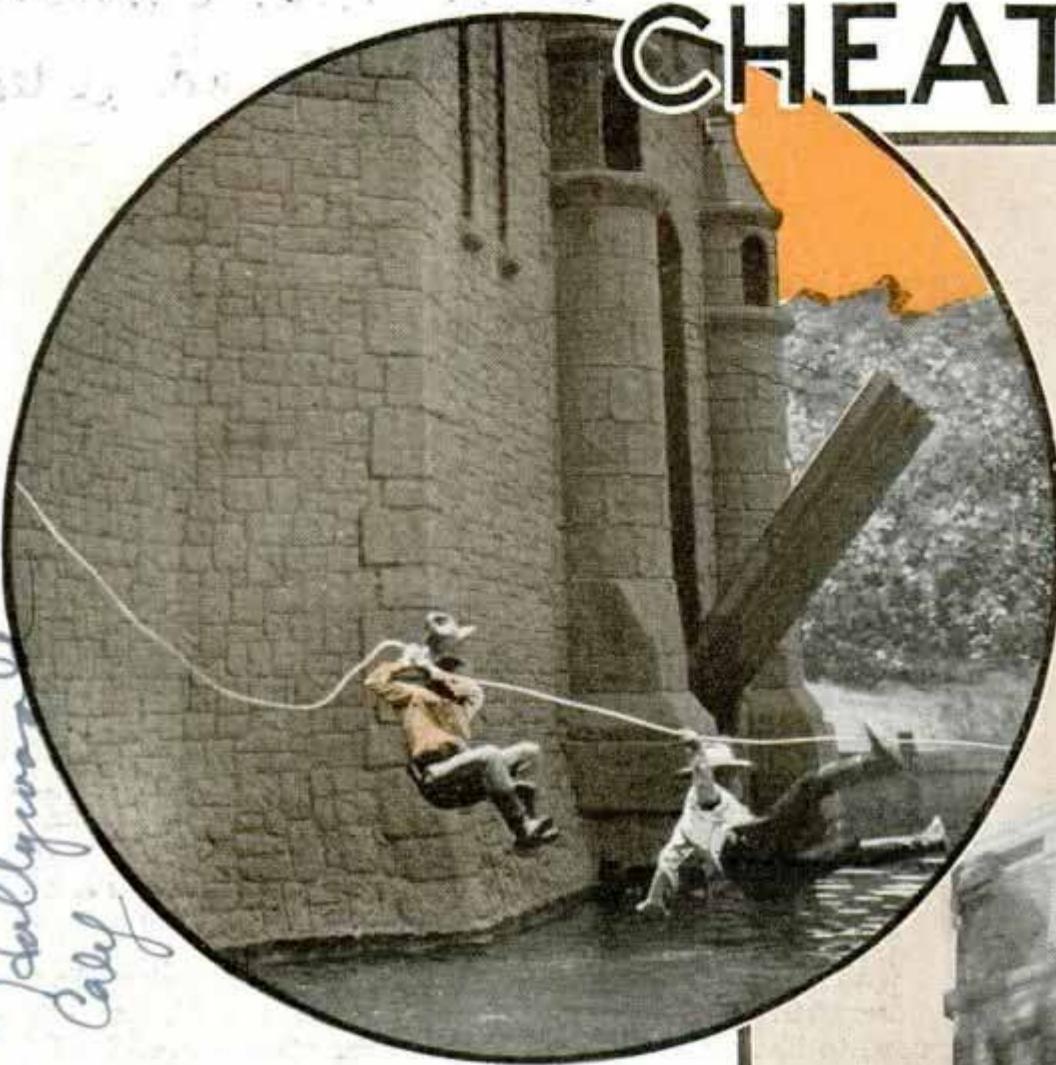


Airport Boundary Light Which Can Be Operated by a Dry-Cell Battery or by Regular Current

Moe Brothers, Inc., Co.

D1311

CHEATING



By BOB ROSE

I BELONG to a strange fraternity. After nineteen years, only six of the original 150 remain. We are the motion-picture stunt men.

I have seen most of the others die, one after another, in performing dangerous feats. Yet, during my own career, I was never seriously injured in doing 560 parachute leaps, eighty plane changes in the air, 150 dives from heights above ninety feet, 180 automobile wrecks, riding horses over cliffs sixty-five times and staging fights atop ninety-foot ship masts and making the proper fall into the water so many times I have lost count. The pioneer stunt men who remain besides myself are Cliff Lyons, Yakima Canutt, Duke Green, Gordon Carveth and Frank Clark.

Fear, worry, temper and impatience—these have taken most of our number. When one is present the stunt man's mind is handicapped. After all mechanical preparations, a stunt man has about seven chances in ten to perform a stunt safely and successfully. Consequently, he always inspects and makes sure of his equip-



Stunt Man Swinging across Street from Burning Building and Two Others About to Get Bath after "Villain" Cut the Rope

Mr. Thomas G. Sumner
10555 Melrose Ave D1311
Los Angeles Calif

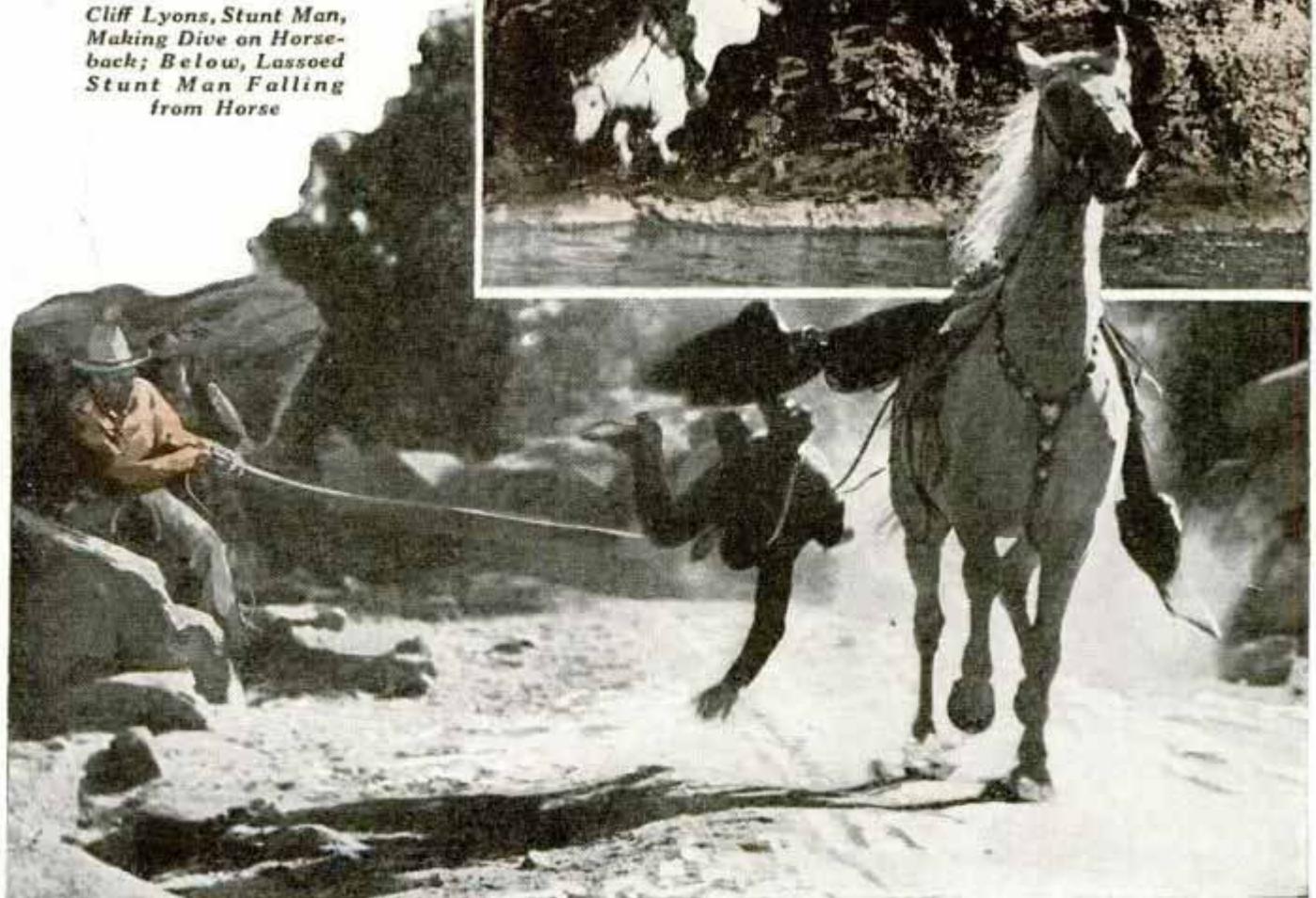
DEATH for a LIVING

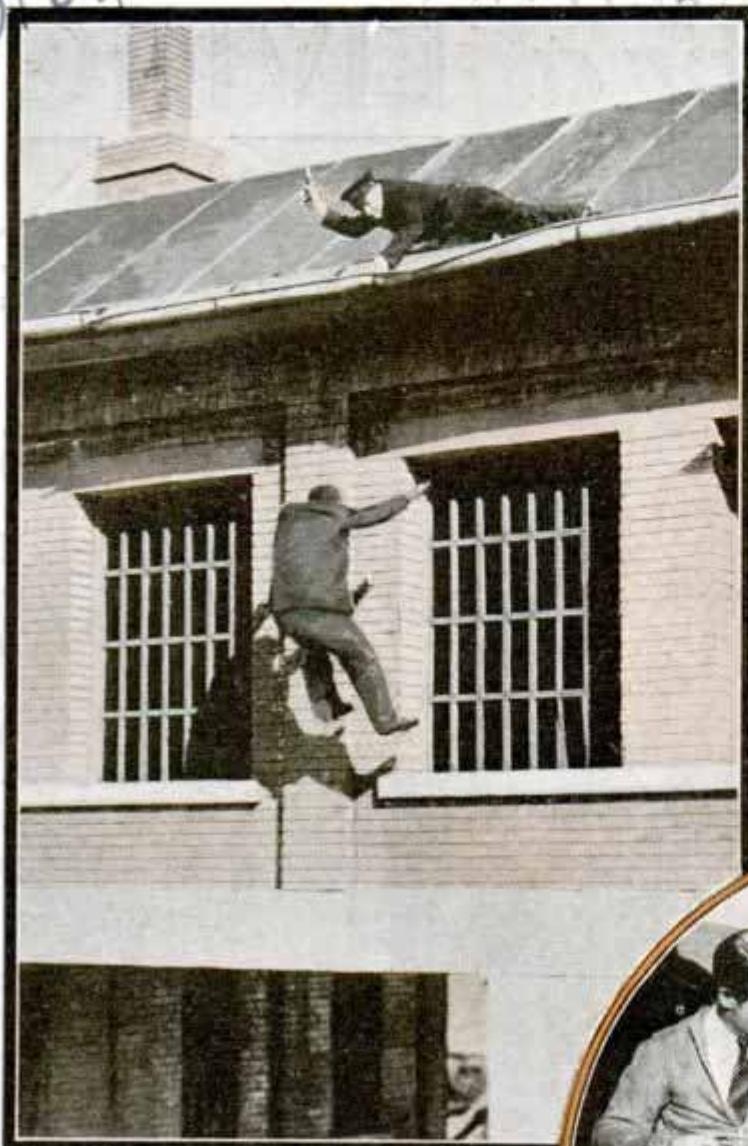
ment. His most necessary assets to overcome the remaining three points of hazard are experience and mental balance.

A mistaken idea is that a trained athlete has all the qualifications to make a stunt man. Overtraining and routine slow the mental faculties. Where the athlete practices one thing until he is perfect in it, the stunt man must never fall into the habit of doing things mechanically. Though great muscular development is not important, perfect physical condition is.

Successful stunt men are credited with having great nerve. They have.

*Cliff Lyons, Stunt Man,
Making Dive on Horse-
back; Below, Lassoed
Stunt Man Falling
from Horse*





But it is not the nerve of the short-lived fool who is merely inviting death. It is the controlled nerve that steadies the mind while the feat is being executed. If I have cheated death where others failed, it is not because of luck or because I am physically superior. It is because I adhered to the teachings of the first and greatest of all stunt men—Harry Houdini. He taught me these fundamentals: "Do every stunt scientifically. Never depend on nerve or luck.

Don't attempt a stunt if you are afraid."

Sometimes the death of a fellow stunt man strikes close to home. I had to wear the blood-spattered clothes in which Jack Silver—"Old Silvertip"—died the day before I did his stunt. It was a leap from a train crossing a trestle to the water beneath. Hesitating a fraction of a second, Silvertip had struck pilings on the far side

of the stream and been killed. We must not hesitate.

One of "Red" Thompson's celebrated stunts was to jump from a speedboat to the back of a whale and harpoon it. Retiring from the business, Red returned again only to exemplify the stunt man's superstition. Stunt men believe that to come back to the game after once quitting is sure death.

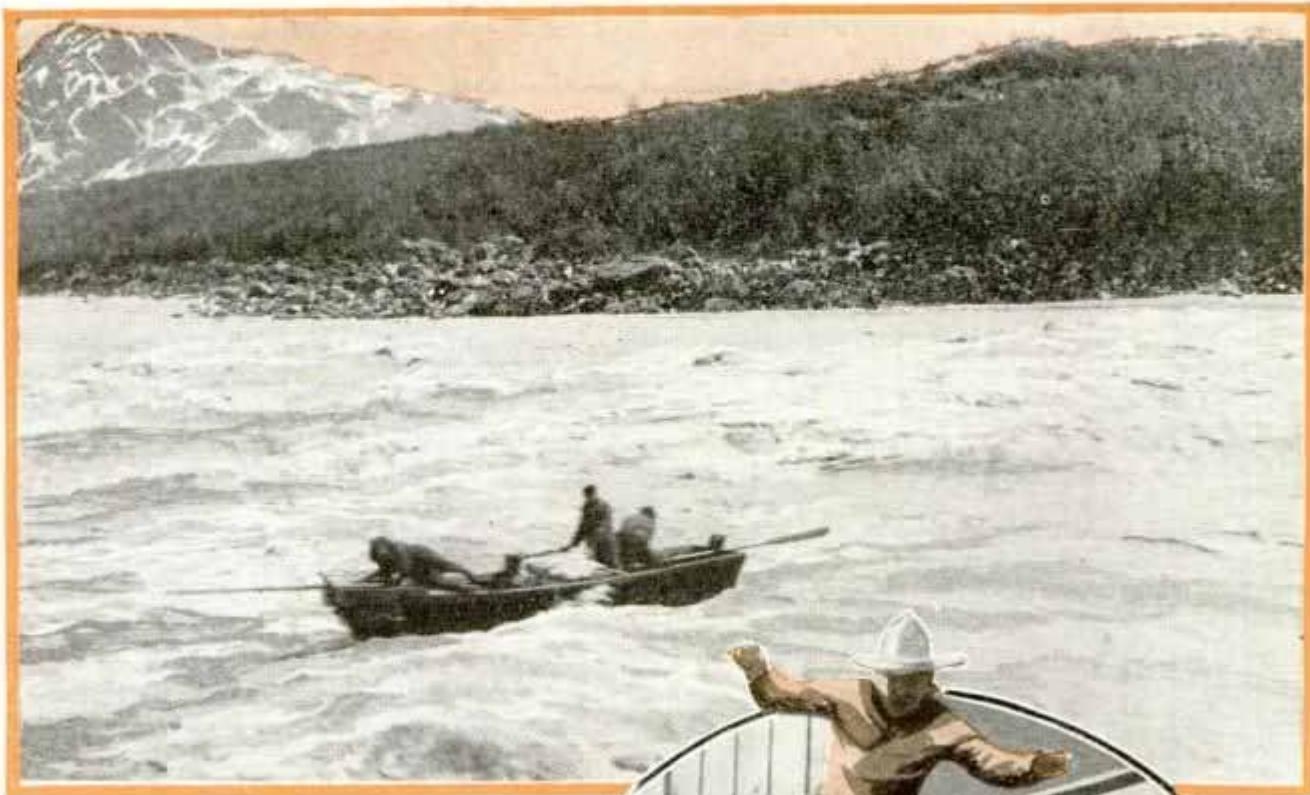
Red, with Jerome Bauten and Howard Daughters, met death in the Abercrombie rapids of Alaska's Copper river. I was shooting the same rapids in another boat. Gordon Carveth was in the Thompson craft. The boat was caught in a terrific whirlpool and smashed on the huge boulders and jagged ice. Struggling in the thirty-five-mile-an-hour current,



Stunt Man in Guise of Escaping Convict Falling from Roof; He Landed in a Moving Auto Below; Bob Rose, the Author, Inspecting Parachute Before Making Jump

Carveth gained shore, missing the deadly boulders that battered Thompson and the other two men to death. My own boat made shore and I raced along the bank, helpless to aid in their grim struggle.

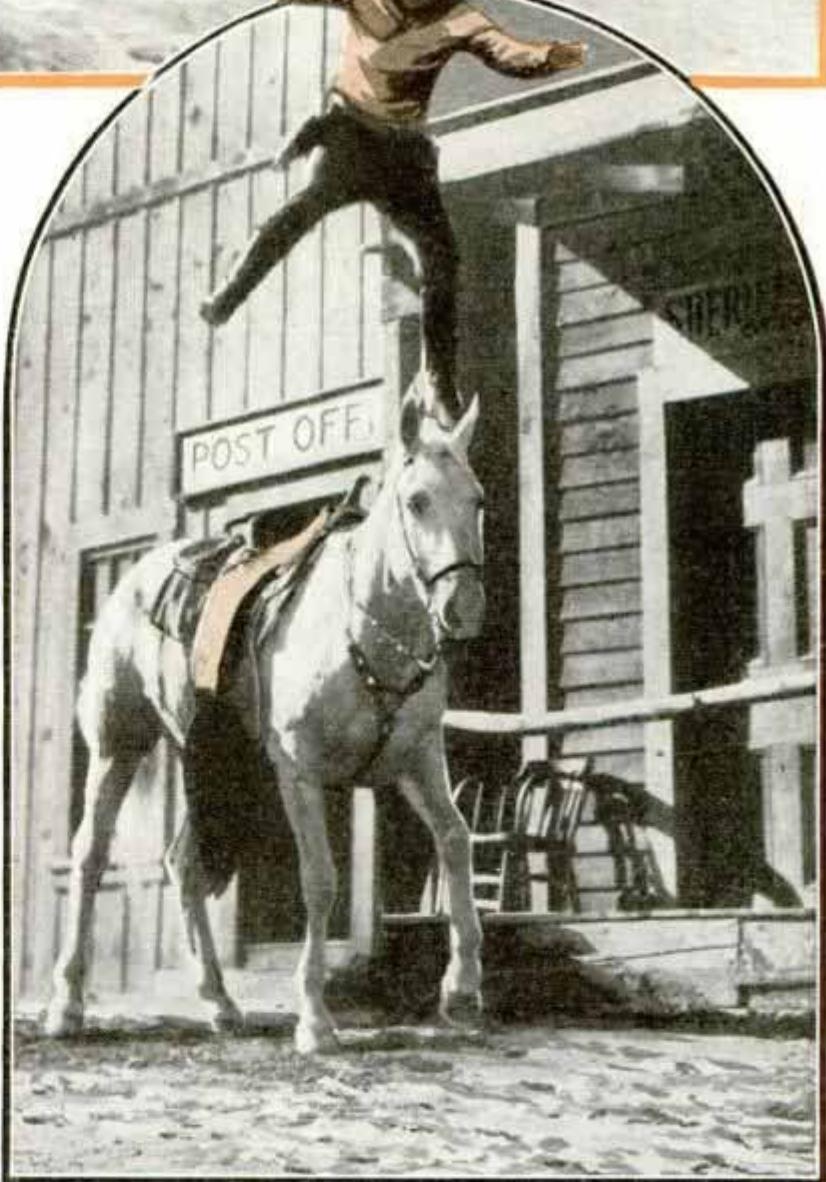
What are my own ideas on this superstition about returning to the stunt game? I do not believe it is just idle superstition. Out of the profession for a time, a man



loses the mental alertness that characterizes the successful stunt performer. On returning and undertaking a hazardous stunt, fear grips him as he suddenly realizes his sense of timing is lost. And in this state he is, of course, unable to execute the feat properly.

A stunt man must never rely on someone else. I did so once and almost lost my life. I was in a crow's nest atop a tower surmounting a house which was to burn under me. The house was on a ninety-foot cliff overhanging the ocean. I was to escape the flames by falling into the ocean with the tower. To offset a stiff wind blowing in from the ocean, piano wire was strung from the tower top to a near-by boat. When the flames got too close, the tower was to be pulled seaward. Having been put up several days before, the wire had corroded from the salt water and I demanded new wire. I was told it already had been strung.

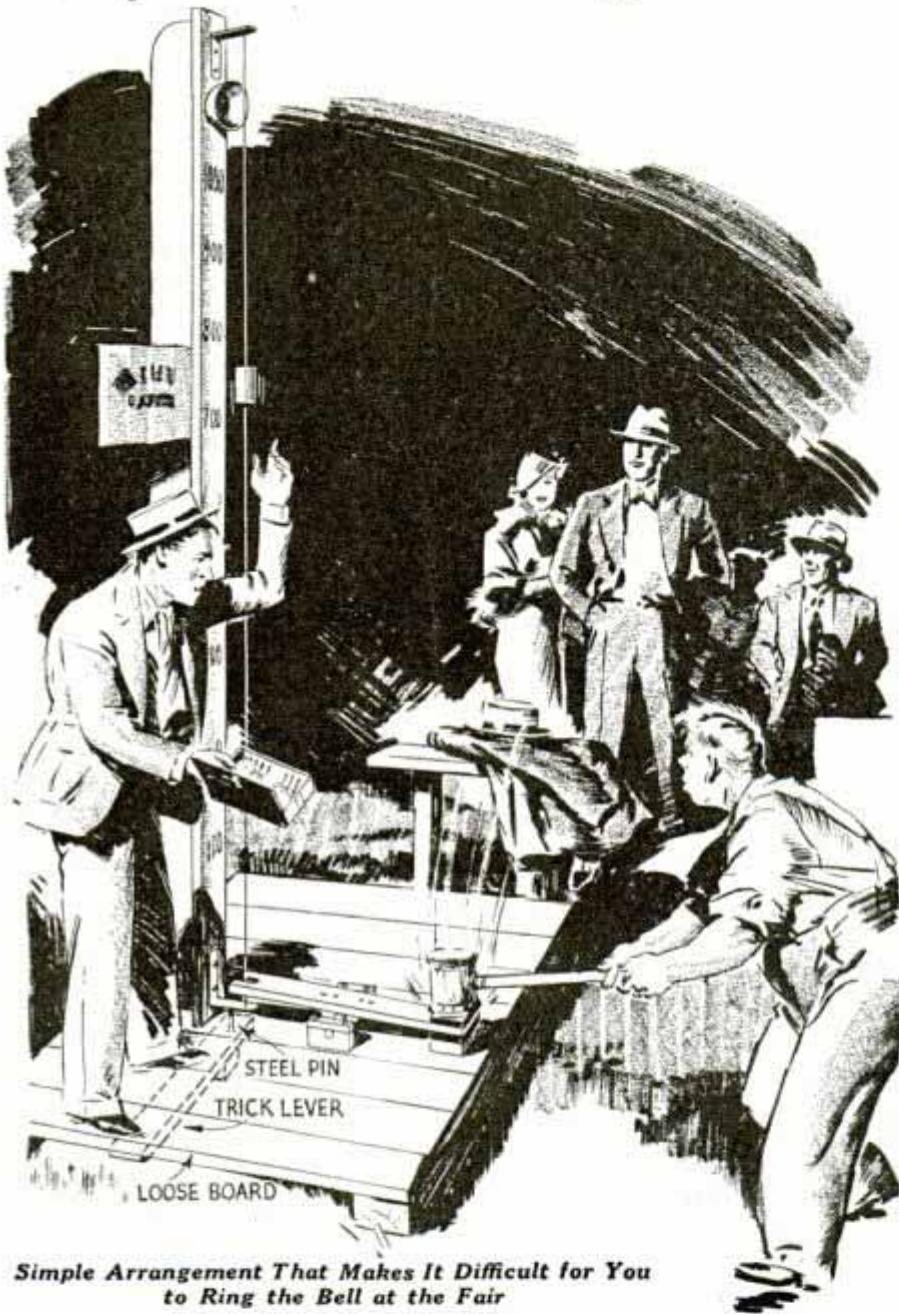
(Continued to page 128A)



Cliff Lyons Jumping from Roof to Back of Moving Horse and, Above, Stunt Men Trying to Negotiate Rapids; Three Were Killed in Attempting This Feat

Charles W. Allen
865 Providence St.
Whitinsville, Mass.

D 1198 Why You Can't Ring Bell of "High Striker"



Simple Arrangement That Makes It Difficult for You to Ring the Bell at the Fair

Ringing the bell of the "high striker" at the county fair appears to be easy when the operator, frequently a small man, tries it. On the other hand strong men find it difficult. The explanation is simple. At some fairs, the machine is "fixed" so that the operator controls the tension of the wire on which the counter block rides. If the wire is tight, the counter block slides freely to the top of the machine, but if the wire is slightly slack, it vibrates sufficiently to retard the progress of the block. The vibration is set up by the player's mallet striking the trip arm. A trick lever, sometimes hidden under a loose board in the platform at the side of the machine, may be depressed by the operator by standing

on the loose board. By depressing this lever, the showman forces a steel pin against the bottom bracket holding the guide wire. This causes the bracket to bend slightly and reduces some of the tension of the wire. Thus, the operator may control the play permitting the bell to be rung or preventing a strong man from ringing it.

D 1385

CLOCK DIAL GAUGE FOR VALVE SHOWS EXACT POSITION

When a valve is turned blindly, there usually is uncertainty whether the flow which it controls is entirely shut off. To remove the guesswork, a clock-dial valve indicator is being produced to prevent leakage in a pipe where there is pressure behind the flow and also to prevent turning the valve too tight and jamming it. The visual indicator, in the shape of a clock face, shows at a glance whether the valve is shut or how many turns

and parts of turns it is open. When the hands point to twelve o'clock, the valve is closed. When the hour hand points to two and the minute hand to twelve, the valve is two turns open. The minute hand indicates the proportion of a turn in addition to the full turn shown by the hour hand, so if the clock points to four-thirty the operator knows the valve has been turned four and one-half times. The indicator is particularly suited to many indus-

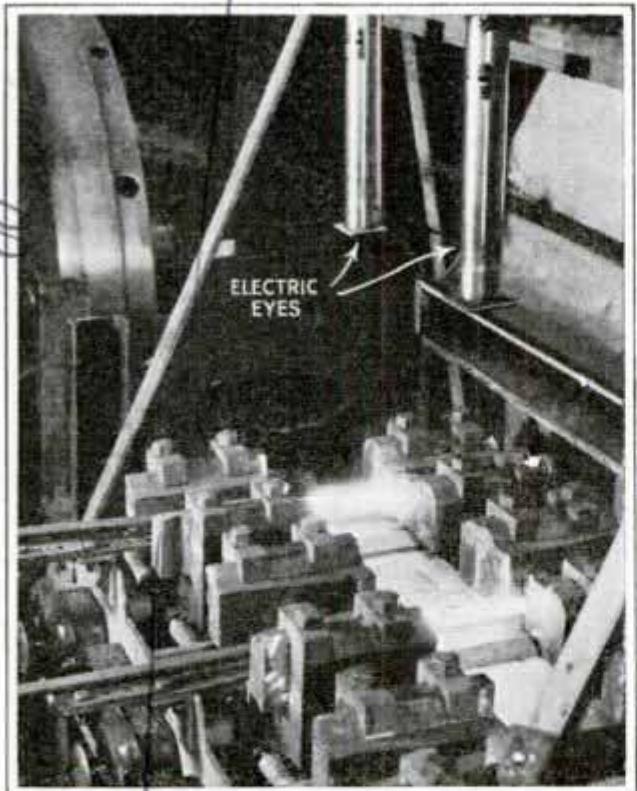


Jeff Jackson, chs.,
P

trial purposes where an accurate regulation of flow is essential.

"ELECTRIC EYE" CUTS OFF HEATERS IN MAKING AUTOS

Standing silent watchmen to guard against too little or too much heat, photo-electric cells are used in an automobile manufacturing plant to switch off electric heaters when steel bars have reached the exact temperature necessary for greatest efficiency. The bars go through a wide range of color from red hot to white hot, but the color changes are too small for the human eye to detect. The more sensitive "electric eye" is used instead. Steering drag links must be heated to a certain temperature for the ends to expand. In the Chevrolet



Left, Illustrating How Bookcases May Be Carried; Right, Installing Another Unit on Top of Portable Case; the Units Lock Together

plant, when the drag links reach that point, the electric eye detects the corresponding color and cuts off the current.

Chevrolet Motor Co.



Left, Illustrating How Bookcases May Be Carried; Right, Installing Another Unit on Top of Portable Case; the Units Lock Together

PORABLE BOOKCASES IN UNITS FIT LARGE OR SMALL HOME

Built in standardized units, portable book cabinets are available for the large or small home. Any size or shape series of bookcases can be quickly set up by arranging the number of units desired on top or beside each other. Any two units of the same size can be bolted together, face to face, to form a tightly closed chest for storage or shipment without disarranging the contents. A handle on the back of each unit makes carrying easy.

D 1395

MAGNIFIER AS PART OF PENCIL HELPS READ FINE PRINT

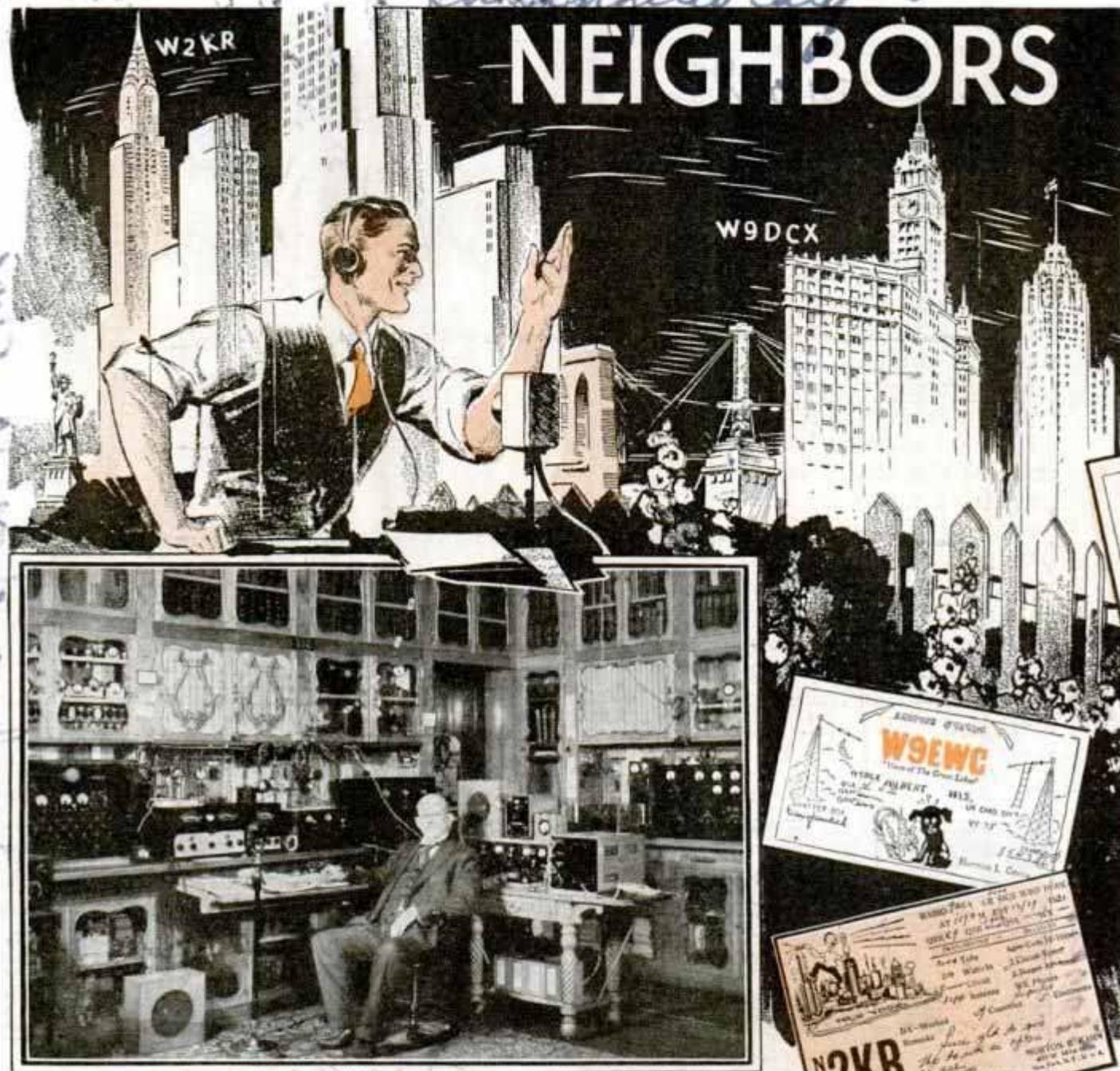
Especially convenient for checking through telephone directories and other fine printed matter, a novelty pencil includes a magnifier in its upper portion. The lens is of cylindrical shape and so constructed that great magnification is possible. The pencil itself is of the filler type, taking standard leads and containing a magazine for extra ones.



E. B. Meyrowitz

D1367

513 Union Bank Bldg
Los Angeles Calif



Above, Pictorial Representation of Ham Conversation between New York and New Zealand by Way of Chicago, California, Mexico, Hawaii, Philippines, Japan and Australia; Verification Cards of Amateurs and Equipment of Dr. James M. B. Hard, XIG, Mexico City Amateur; Below, Clyde De Vina, Hollywood Cameraman Whose Life Was Saved by a Quick-Thinking Ham in New Zealand

"C Q—C Q—W6HHU calling and standing by——."

This was the call from Albert Hanson, radio amateur, which brought details of the disastrous Long Beach earthquake and started the rush of relief.

With telephone and telegraph lines crippled, radio "hams" restored communication and shattered the veil of silence into which the tragedy had plunged the stricken area.



D136791Q

OF THE AIR



Above, Miss Chigono Sugita, J2IX, a Tokyo Ham; Left, High-Power Transmitter of Thorne Donnelley, W9PZ, Lake Bluff, Ill.

hours following. Albert Mutter went on the air with his W6BCK, and Eddie Miller, W6AZU, dug himself out of the damaged and brick-strewn control room of KFOX. He got the station on the air. Communication was restored—hysteria was silenced—the world moved on.

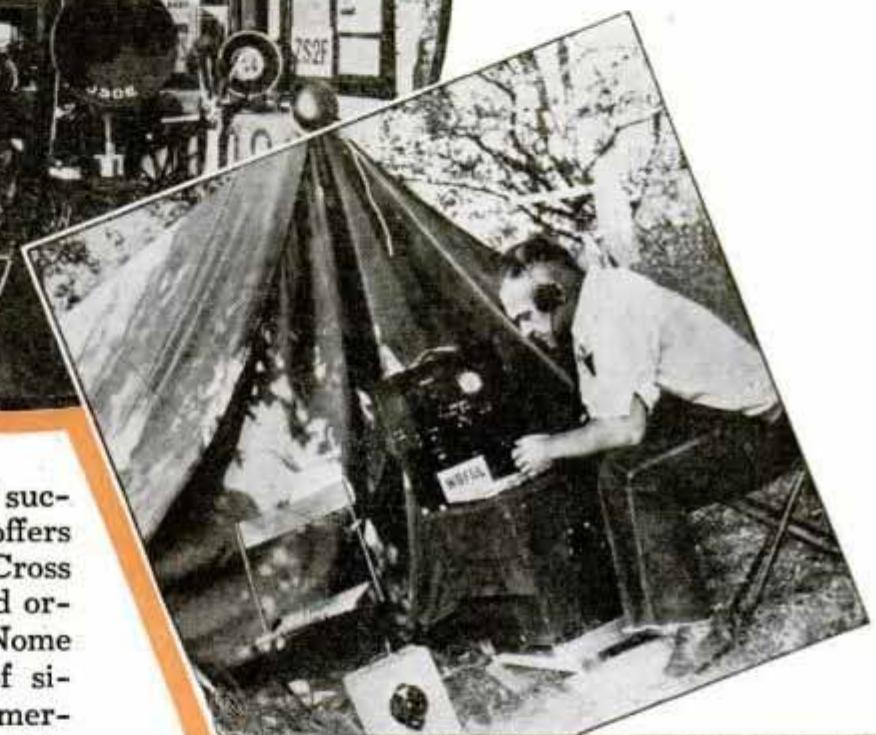
Volumes could be written of the tense drama of those first few hours, but this is the story of the radio amateur. Out of the north comes a flash from the commercial operator at Nome, Alaska:

"Nome is burning! The city is a mass of flames. People are screaming in the streets—fleeing the flames—" and the message stops! The power lines have burned down.

Jamison Vaughter, W6FXS, set up a portable transmitter at Midwick Relief hospital where the injured were pouring in. Barnett Harper of W6DCF joined in. W6DBC and W6EXT hooked up in the web. More than a thousand messages were sent to all parts of the world in the thirty



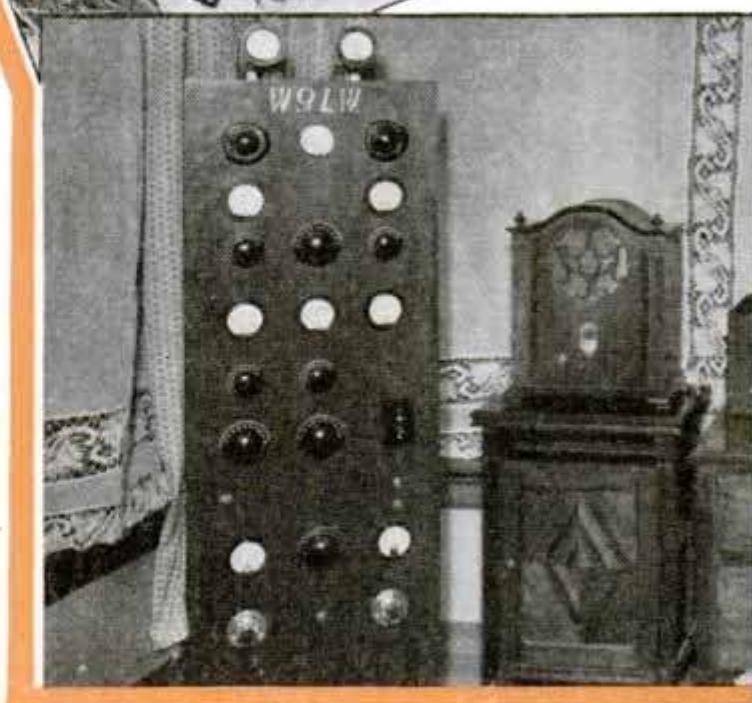
Q 136 2
Left, a Japanese Ham and His Family or, in the Words of the Hams, the "O. M., the O. W. and Ass't Op."; This Means, When Freely Transmitted, the "Old Man," the "Old Woman" and the "Assistant Operator"; Below, Portable Transmitter as Used by a Camper



People leap to the task of succor. The mayor of Seattle offers the aid of his city. The Red Cross gets ready. The Coast Guard orders all available vessels to Nome waters. But the dilemma of silence is with them. The commercials are helpless, and once again the world pauses, hesitant. Up in Nome the faint pulse of the K7 amateurs is going out, the hams in Seattle are listening and the miles are bridged. Once again, in the clinches with disaster, the hams come through.

There are 60,000 radio amateurs in the world, 45,000 in the United States alone, and the other 15,000 scattered in every conceivable spot on the face of the globe. It is virtually impossible to be so isolated an amateur can't find you.

In the endless seas to the south, a tiny sailboat loafed along below the Islands of Pago Pago. The captain was stricken with appendicitis. The speediest boat could not reach him in time. Death hovered over the tiny craft. A distress signal was flown and a tuna boat, equipped with a short-wave transmitter, sent out its feeble signal. A ham heard it and crashed

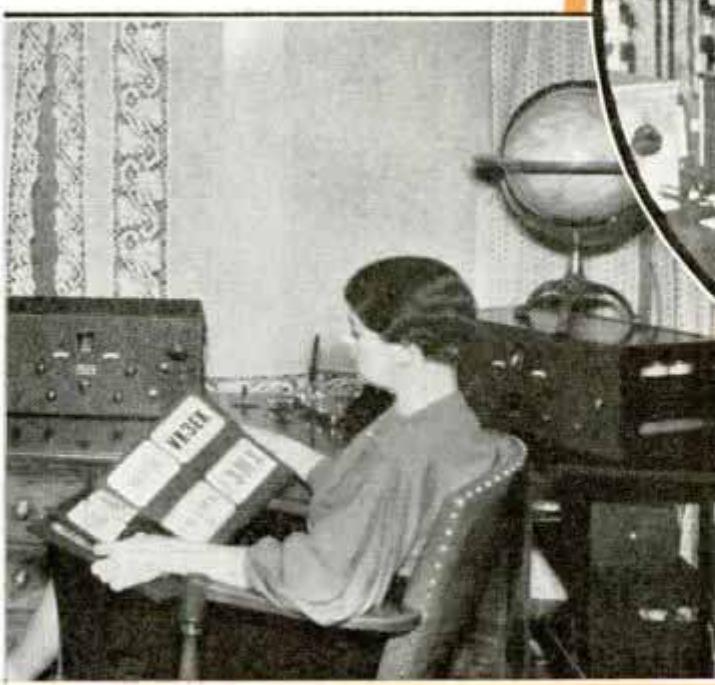
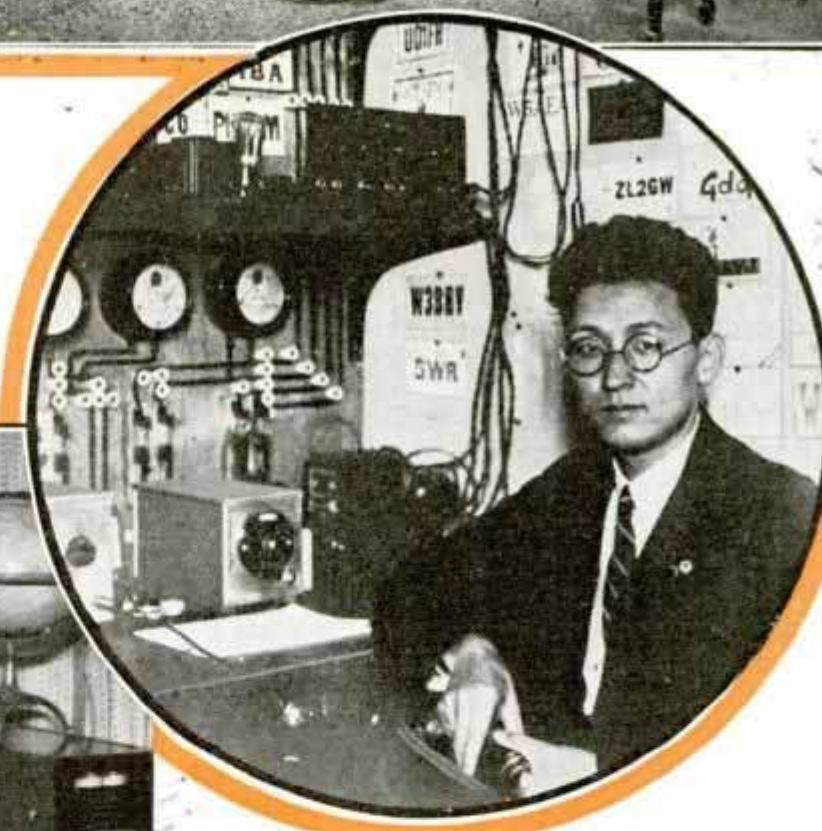
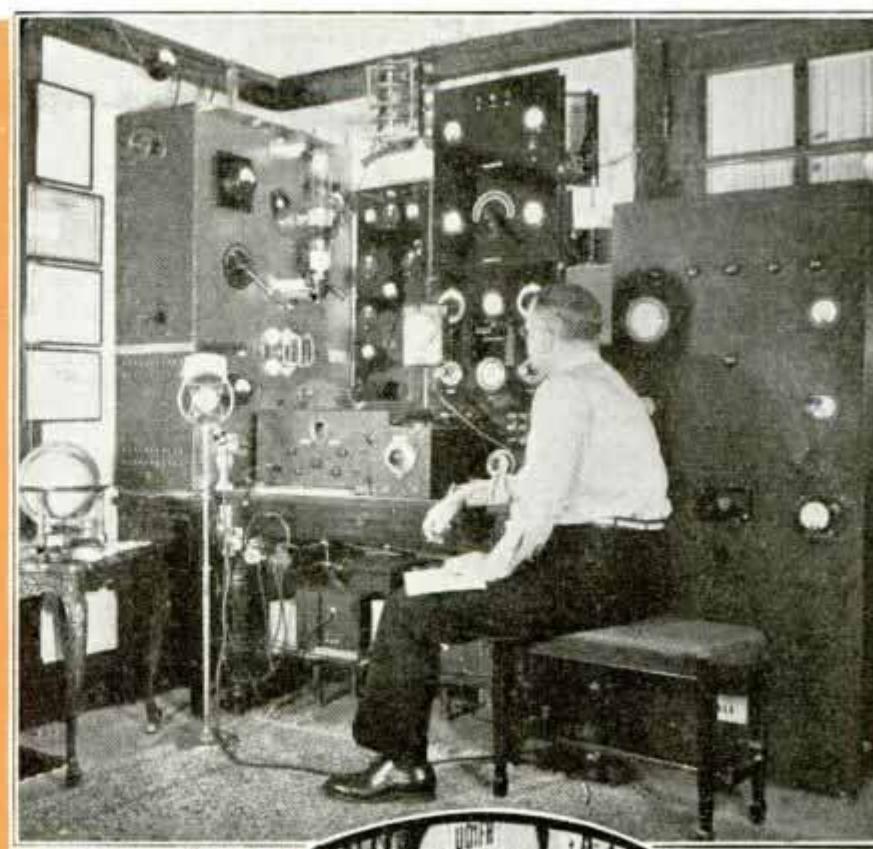


Mrs. L. W. Mida, W9LW, Chicago, One of the Many "Y. L's" or Women Amateurs, and Her Transmitter

into the air with his powerful wave. Another ham—another relay, and an ambulance seaplane was sent from the Panama Naval base.

Clyde De Vina, a Hollywood cameraman on location near Teller, Alaska, was talking over his set to an old friend in New Zealand. Suddenly De Vina's signals stopped in the midst of a transmission—the ham in New Zealand wondered why and asked another ham in Teller to investigate. De Vina was rescued from his monoxide filled shack before the deadly generator fumes could finish their work. Twenty thousand miles of messages in less than twenty minutes—and another life was saved!

But this fascinating hobby is not all excitement. Tedious study of technical matters is necessary before even a license can be obtained.



Top, Frank L. Brittin, W9DCX, Chicago, and His Compact Transmitter; in Circle, a Japanese Amateur

The code must be mastered to the speed of ten words per minute or more. The paths of the elusive electron must be followed through wires and tubes before one can put them on the air.

Uncle Sam is fussy about this, and maintains a small army of radio inspectors and monitor stations that check every signal

(Continued to page 140A)

D 1410

CONTROL FOR PLANE PROPELLER OFFERS SAFER FLYING



Hamilton Standard Propeller Co., East Hartford, Conn.

Control for Plane Propeller Which Adjusts Pitch without Any Change in Revolutions

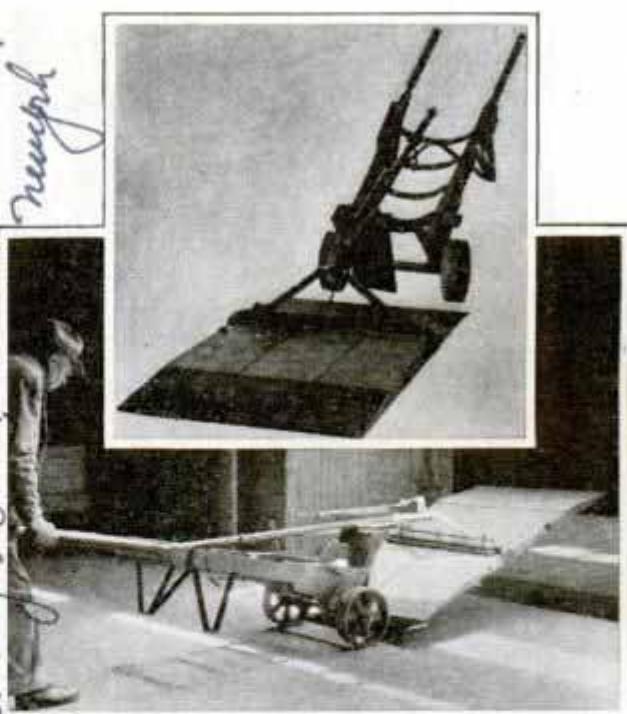
Greater speed, safety and efficiency of aircraft are promised by the development of a "constant speed" propeller, made possible by a propeller control weighing only a few pounds and operating hydraulically through oil pressure which acts on the blades of the air screw. This control maintains automatically any selected rate of revolutions of which the engine is capable, and adjusts the pitch of the propeller blades through their full range without action by the pilot. The effect on an airplane is like having an infinite number of automatically selected gear ratios on an automobile. In a recent demonstration, the control was placed on a twin-motor transport which took off, climbed to 2,000 feet, then to 4,000 feet, dived, speeded up to 200 miles per hour and slowed down to ninety miles per hour, all with the propeller revolutions remaining constant. The control makes it easy to synchronize motors, eliminating the "beat" due to unsynchronized

engines in multimotored ships, reduces vibration by allowing the engine to operate at its best ranges of revolutions, abates noise and increases the take-off power. It is also claimed the control increases speed. By using the constant speed propeller, it is claimed twenty-six minutes could be saved on a 600-mile trip by climbing at once to about 13,500 feet, cruising there and then "coasting" down for the last seventy-five or 100 miles, since the control would prevent the engine from turning up excessive revolutions in such an extended glide. This permits a gain in forward speed without additional strain on the motor.

D 1429

LIFTER ON HAND TRUCK MOVES FREIGHT CAR RUNNING BOARDS

Freight car running boards extending from car doors to platform are lifted and moved about easily with the aid of an ingenious attachment for a hand truck developed by the foreman of a railroad shop in Tacoma, Wash. The lifter is attached to the edge of the truck, a lever holding a large clamp in position for grasping the board at the middle of the two sides. Mov-



Hamilton Standard Propeller Co., East Hartford, Conn.

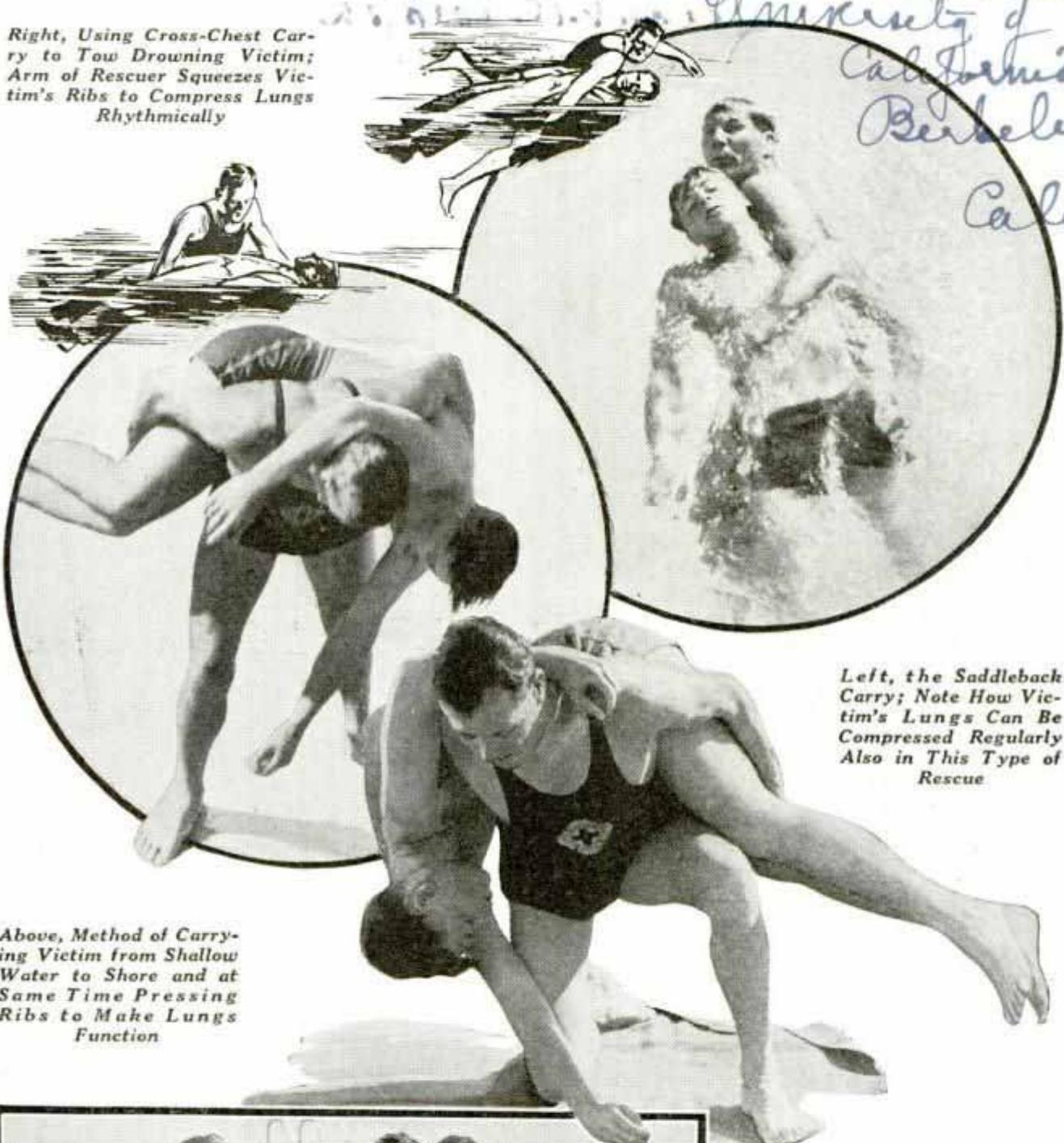
Lifter on Hand Truck for Moving Heavy Running Boards Extending from Freight Car to Platform

ing such a board is usually a difficult task for two men, but by lowering the truck, the board can be grasped by the clamp and then easily moved about by one man.

used on Milwaukee Railroad

These Tricks May Enable You to Save a Life

Right, Using Cross-Chest Carry to Tow Drowning Victim; Arm of Rescuer Squeezes Victim's Ribs to Compress Lungs Rhythmically



Above, Method of Carrying Victim from Shallow Water to Shore and at Same Time Pressing Ribs to Make Lungs Function

Left, the Saddleback Carry; Note How Victim's Lungs Can Be Compressed Regularly Also in This Type of Rescue



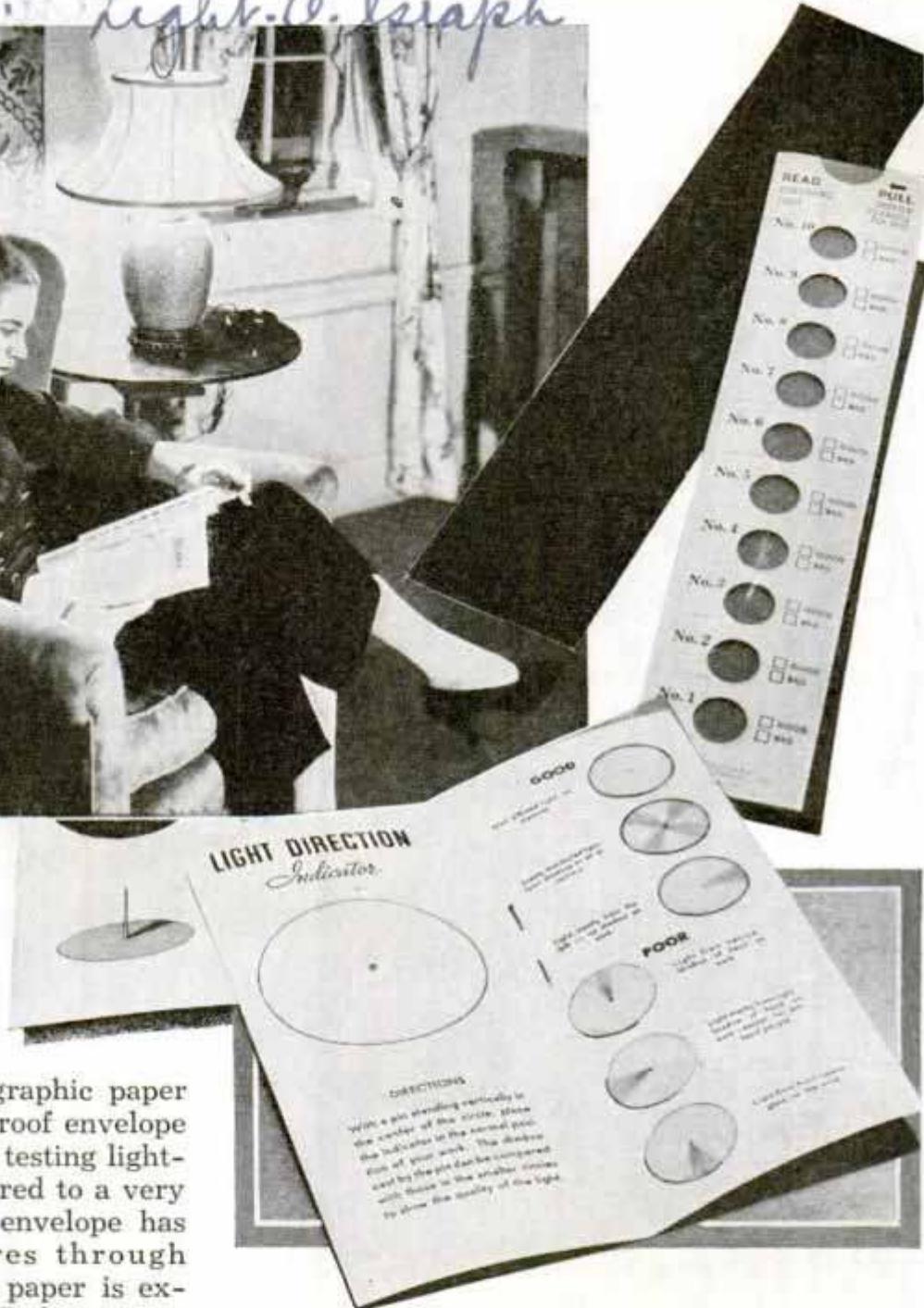
Left, Employing Artificial Respiration; the Method of Compressing Lungs of Victim Regularly While Effecting Rescue Was Developed by George Hughling

Paper Indicators Test Light to Protect Eyes



D 1416
Left, Testing Intensity of Light with Sensitive Paper; Right, the Indicator; Below, Another Paper Indicator That Shows If Light Is Coming from Right Direction

Sensitive photographic paper inclosed in a light-proof envelope is a simple means of testing lighting conditions. Colored to a very definite shade, the envelope has ten round apertures through which the sensitive paper is exposed to the light. Before exposure the paper is a light yellow, but as it is exposed to light, it turns darker. In two and one-half minutes, under proper lighting intensity, the paper will turn as dark as the envelope. If it is lighter, the lighting is not of sufficient intensity. A further check on illumination can be made with a light analyzer. A pin stuck vertically in the center of a circular disk throws a shadow and discloses whether the light is coming from the proper direction. Coming from the left, the light properly illuminates the desk top or reading page. The photographic indicator, developed by



Westinghouse Lamp company, and the analyzer are inexpensive means of testing lighting in the home.

HEALTHIEST SPOTS ARE FOUND IN WEST AND NORTHWEST

D 1459
Three states in the northwest and an area in the middle of the United States extending from Texas to the Canadian border are the healthiest regions of the country, judged by the annual death rates for a three-year period. In North and South Dakota, less than eight out of every

*cl insurance
An Insurance Co
on Madison Ave.*

1,000 persons die each year. The rate for the entire country is ten per thousand. Next lowest death rates, between eight and nine per thousand, are found in Nebraska, Kansas, Oklahoma, Minnesota, Iowa and Wisconsin, and in the three states of the northwest corner, Washington, Oregon and Idaho. The highest mortality rates also were found in states which adjoin, Arizona and New Mexico having rates of more than twelve per thousand, while Colorado and Nevada death rates are between eleven and twelve per thousand. The influx of people suffering from tuberculosis probably accounts, in part at least, for the relatively high death rates in these states.

D140 2.

TRUCK TRAILER LIKE BOX CAR USED TO HAUL FURNITURE

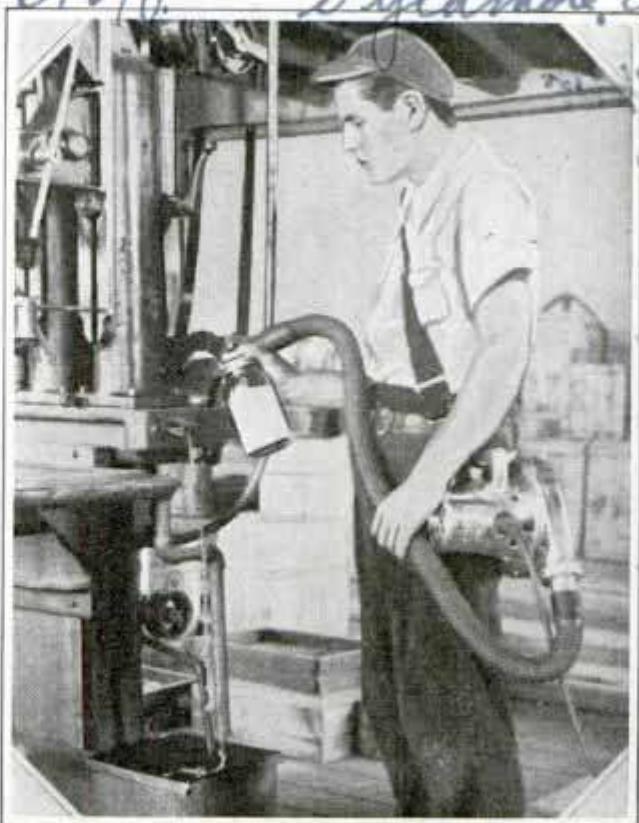
Truck trailers constructed to resemble freight cars are used for their publicity value by a Pacific coast furniture dealer. Some are in the form of box cars, and others are built like gondolas or flat cars. They are like freight cars also in that they are equipped with air brakes.



Truck Trailer Built to Resemble a Box Car and Used to Haul Furniture on Pacific Coast

SHOP CLEANER SPRAYS PAINT OR BLOWS AWAY DUST

Designed for home work shops, garages, machine shops and woodworking plants, a new device can be used as a blower, paint sprayer or suction cleaner. For convenient handling, it is suspended on the operator by a shoulder and waist strap. It consists of an inclosed motor and fan with an outlet for the blast and an inlet at the cen-



Handy Sprayer or Blower That Operates Like Vacuum Cleaner; Note How It Is Carried

ter of the fan for suction. A four-foot hose may be connected to the outlet for paint spraying and blowing, or to the inlet for suction cleaning. The spray device consists of a glass jar fitted with a nozzle that is connected to the hose. For blowing purposes, a long metal nozzle is used instead of the hose.

D139 2.

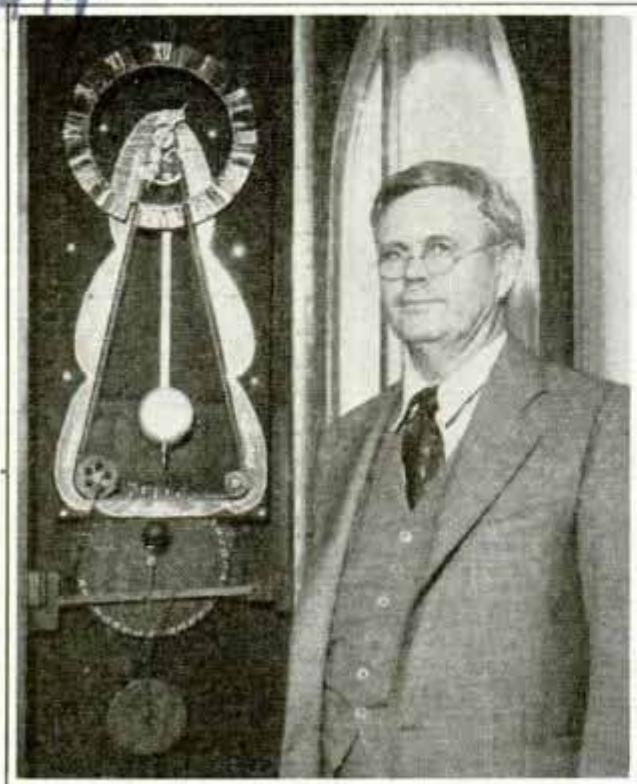
ELECTRICAL ROTARY PLANER HANDY FOR CRAFTSMAN

For smoothing, shaping and reconditioning wood surfaces, a new portable rotary planer saves many hours of manual labor. Its motor operates on alternating or direct current, 110 volts, or 220 or 250 volts, if desired. The planer contains three planer blades that are adjustable for deep or shallow cutting. Two planer heads are included in the outfit, one with a comparatively flat face for surfacing work, the other with a rounded face for gouging.



O'Slack + Stecher Mfg. Co
600 Pennsylvania

Clock Records Passing Days Like a Calendar



This Clock Tells the Time of Day, the Day of the Week and Month, and Phases of the Moon

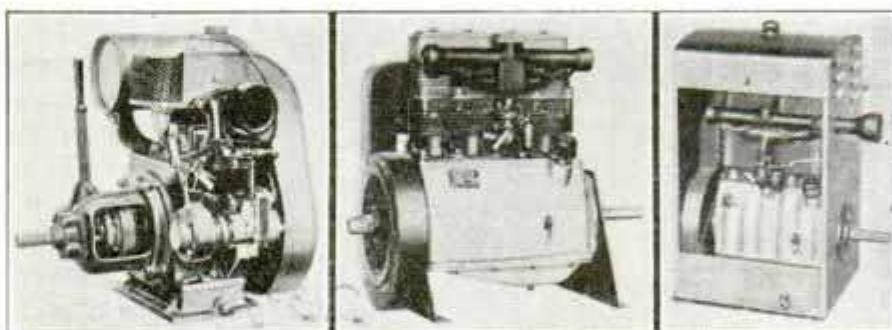
After spending five years of spare time in designing it, Price Kiker of Fort Worth, Tex., needed only five days to construct a calendar clock which tells the time of day, the day of the week and month, and graph-

ically shows the phases of the moon by means of a revolving ball. The clock is driven by springs and is considered extremely accurate. A sprocket wheel, attached to the clock shaft, directly under the hands, revolves once in twelve hours. This wheel drives a chain having 196 links which makes a revolution in seven days. A small disk or day indicator is attached to this chain. Along the path of the disk are shown the seven days of the week, each occupying a four-inch space, the disk traveling four inches each twenty-four hours. A larger sprocket revolves once each twenty-four hours. A pin on this sprocket contacts a projection on the day of the month wheel and moves it one point forward with each revolution. This ten-inch wheel must be reset on the first of the month. This large sprocket wheel also moves the moon wheel at the bottom of the clock. This is done with levers which turn the moon wheel once in twenty-nine and one-half days. A flexible shaft connects the moon wheel with the ball representing the moon. This ball is painted black on one side and the other half has a silver coating. This ball thus duplicates almost exactly each phase of the moon during the month.

Midget Gasoline Engines Have a Wide Variety of Uses

Power for various kinds of stationary and movable machinery and for small homemade autos is supplied economically by a compact air-cooled gasoline engine of either one or four cylinders. Four models of the one-cylinder type vary from two to six horsepower and the four-cylinder model varies from seven to sixteen horsepower, depending on the revolutions per minute of the crankshaft. A large fan cast in the fly wheel supplies a strong blast of air through a housing directly around the cylinders and head, thus eliminating the radiator, water pump and fan belt. All parts are automatically lubricated which eliminates oil cups and

fittings, and a clutch, shifting mechanism, electric starter and generator can be supplied if desired. Gasoline is the regular



These One or Four-Cylinder Gasoline Engines Have a Wide Variety of Uses; at Right Is a Motor Housed for Stationary Purposes

fuel but accessories can be added so that kerosene, natural gas or fuel oil can be burned instead. The four-cylinder motor is about two feet high and two feet long and weighs 230 pounds.

Shovels Attached to Wheel in Big Excavator



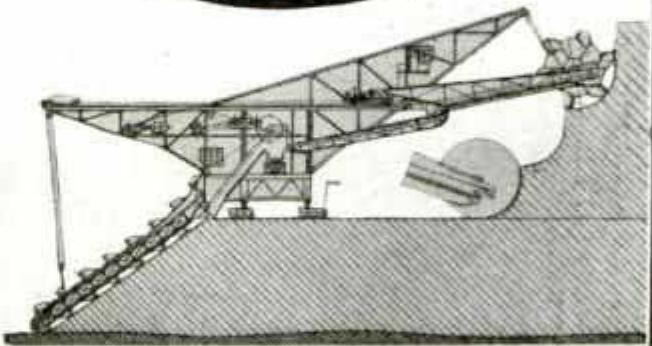
Several Views of Giant Excavator Machine; Circle, Right, Close-Up of Buckets Attached to Wheel; It Reduces Chance of Breakage

Faster work on excavations is made possible by a German machine which consists of a large wheel to which are attached scoops or shovels. This equipment is a substitute for the excavators fitted with chain and buckets. In tests, it has been found that the shovel wheel gives more satisfactory service, since it is not subject to as much delay on account of breakage. In the old machine, the chain frequently broke under heavy loads. One new excavating machine has both the shovel wheel and the chain buckets, being equipped for every kind of work in that field. The shovel wheel is capable of handling 15,090 cubic feet of wet sand per hour.

— D 1534.

COLORS STAMPED ON PORCELAIN

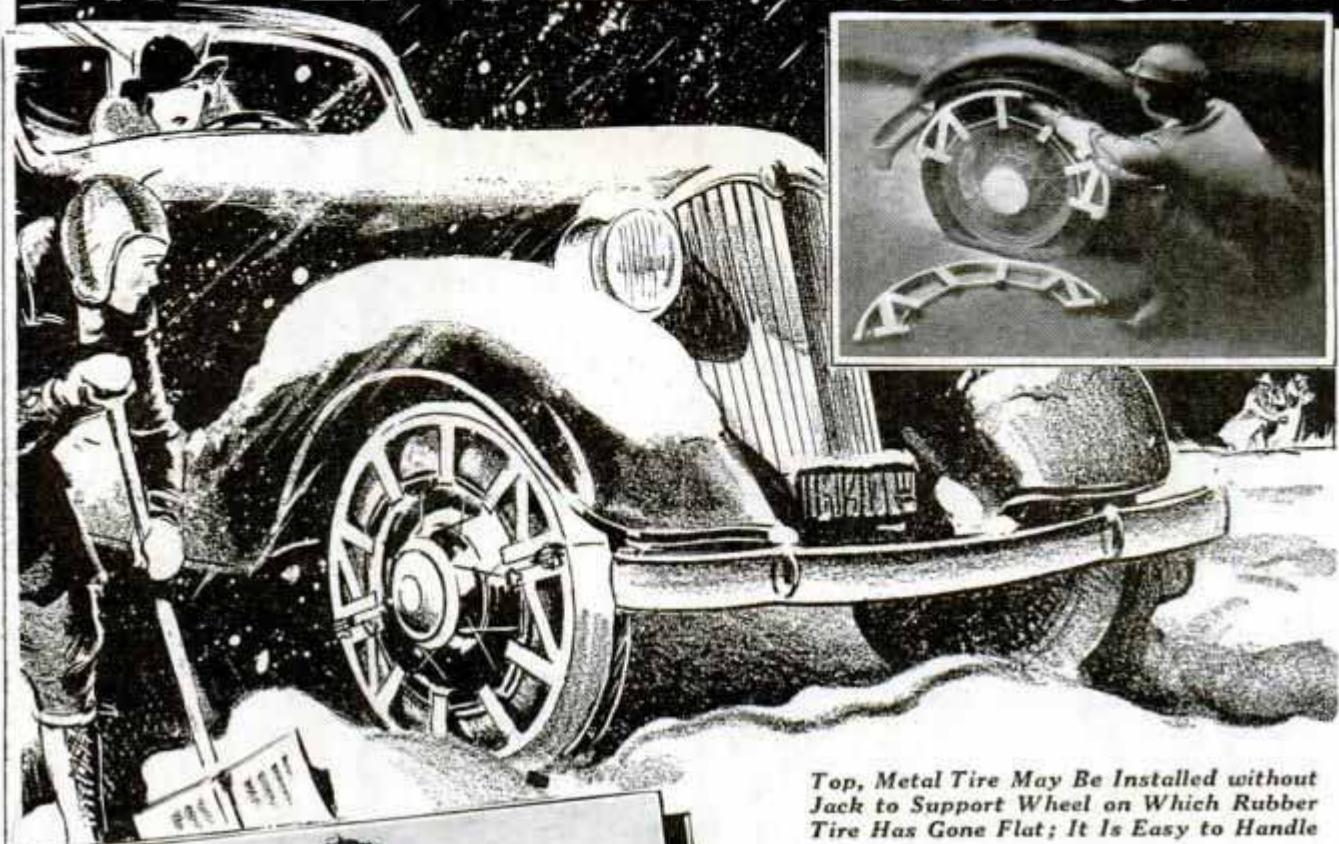
Attempts are being made by the Japanese porcelain industry to produce an efficient mechanical stamper to place col-



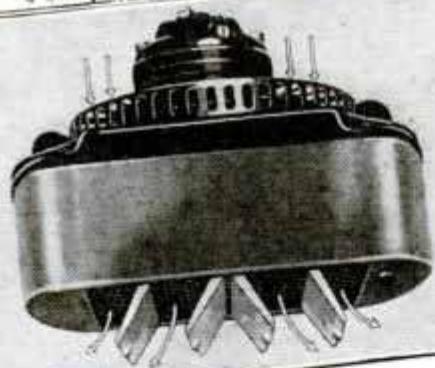
ored designs on porcelain, thus reducing the expense of producing decorative porcelain pieces. Successful experiments have been conducted with simple designs in six colors and tests now are being made to adapt the machine to more complicated designs and a larger number of colors.

Dept of Commerce. Gross memo.
12/1/34

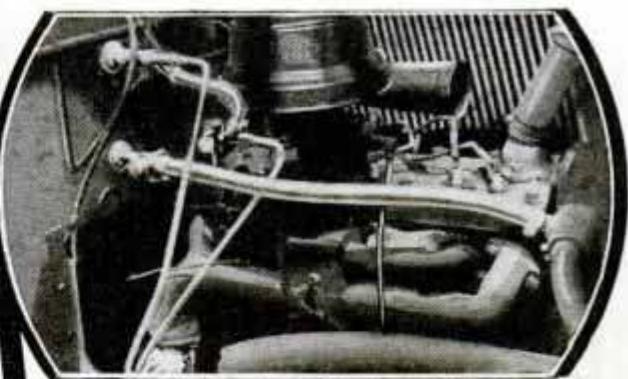
The LATEST Comforts



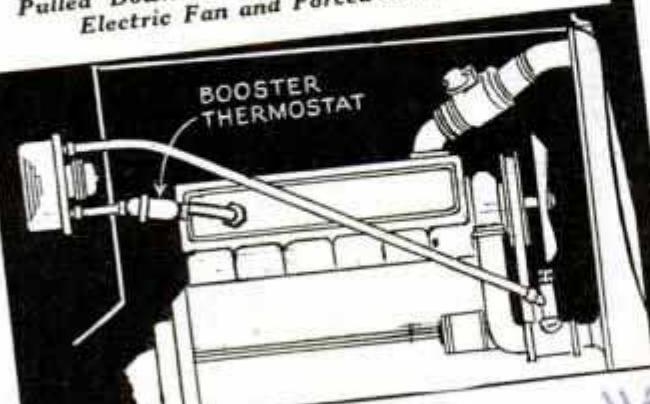
Top, Metal Tire May Be Installed without Jack to Support Wheel on Which Rubber Tire Has Gone Flat; It Is Easy to Handle



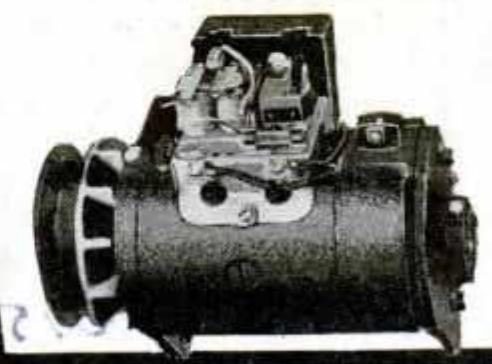
Above, Downdraft Hot-Water Heater; Air Is Pulled Down through the Heater Coils by Electric Fan and Forced Out Below



Above, Steam Conversion Unit as Installed at Engine; It Turns Hot-Water Heater into Steam Heater



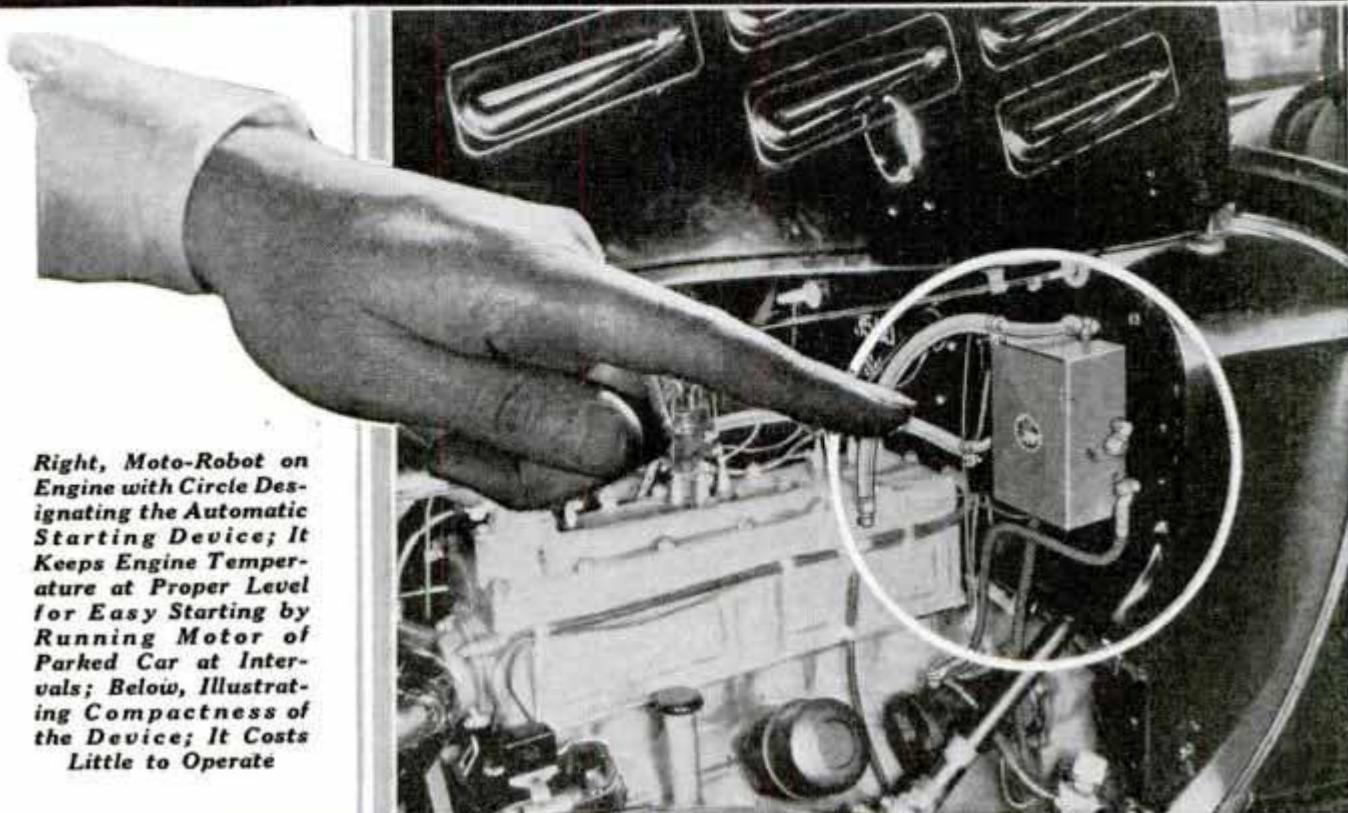
Above, Showing Booster Thermostat Installed in Hose Leading from Motor to Heater; It Causes Water to Warm Up Faster



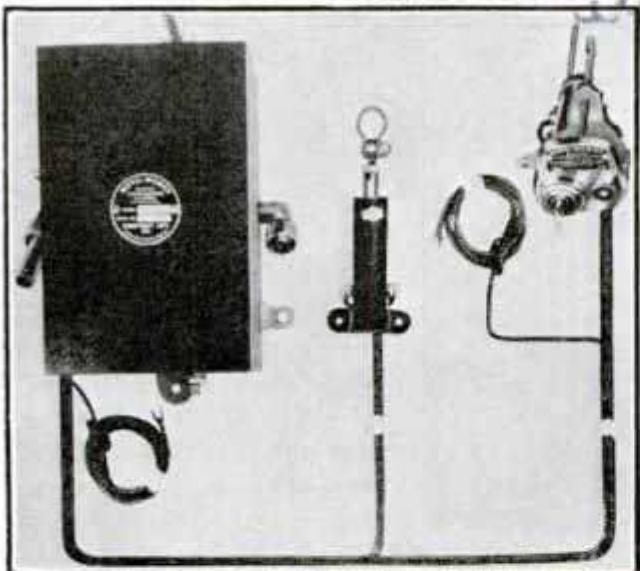
Above, High-Capacity Generator Produces More Current for the Car and Electrical Appliances; Forced Draft Keeps It Cool

© The Russell Service 1297
115 Walbridge Road, Hartford Conn

for the WINTER Motorist



Right, Moto-Robot on Engine with Circle Designating the Automatic Starting Device; It Keeps Engine Temperature at Proper Level for Easy Starting by Running Motor of Parked Car at Intervals; Below, Illustrating Compactness of the Device; It Costs Little to Operate



FOR the first time winter winds may blow without the automobile owner feeling that the icy blasts mean only inconvenience and discomfort.

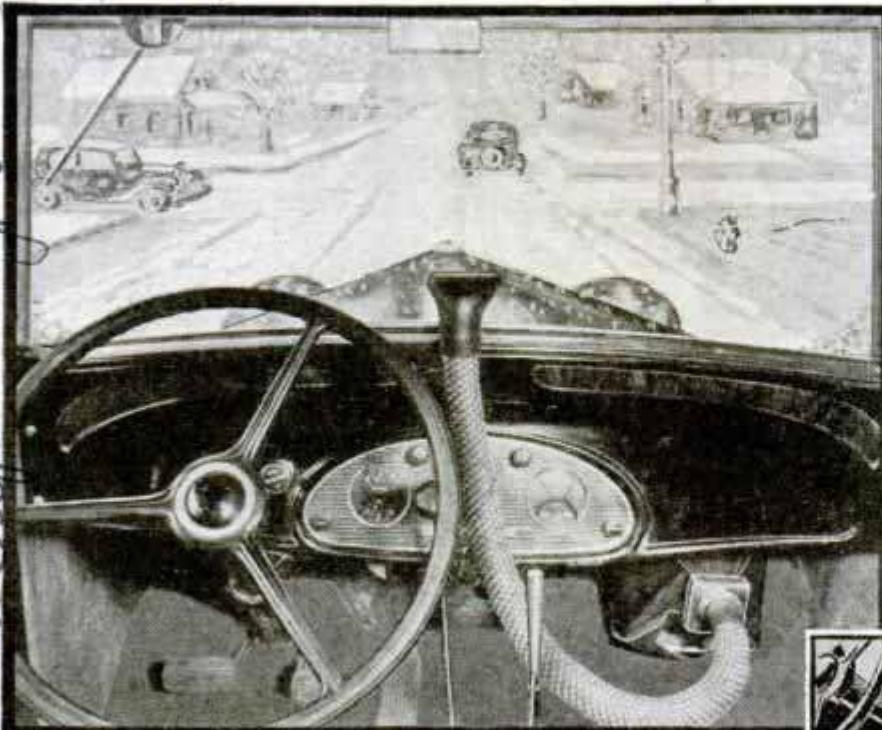
Typical of the strides taken to make winter motoring a pleasure are the new windshield defrosters. In addition to the electric type which heats a special enclosed area of the windshield, there is an attachment that conducts heat from the car's warming device to the inside of the windshield. A skirt fits over the front of

the heater while a flexible tube, similar to the hose used with a vacuum cleaner, carries the hot air to a special nozzle held to the windshield by a rubber suction cup. Since the heated air does not leave the car, occupants find that they can have clear vision and bodily comfort at the same time. One hot-water heater has a sleet pipe connection.

Starting need no longer be the zero morning worry. With a strong coil, one of the high-capacity batteries, new breaker points and spark plugs of the right heat type even an ailing engine has a fair chance. To guard against battery weakness, due to the strain of furnishing current for many new electrical appliances, the accessory people offer special battery boosters or chargers. By special wiring it is possible to plug in a charger at the instrument panel instead of fussing with the battery direct. Over night a battery obtains sufficient charge to give the motor a vigorous spin. One of the boosters can be left plugged in during the starting process, thus providing an unfailing source of cranking energy.

Aiding the winter start is a special dis-

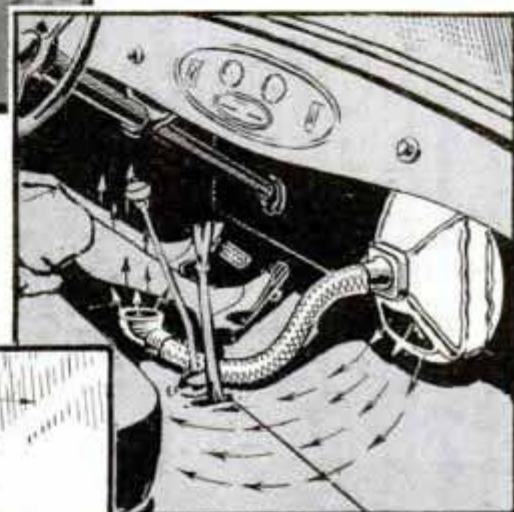
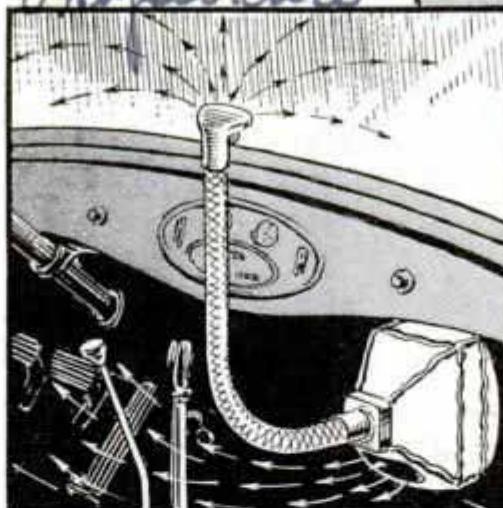
Super. Electric
Electric Supply Co.



Top, Defroster Hose Supplies Warm Air to Clear Windshield; Right, Warm Air Directed to the Driving Compartment; Bottom, How Defroster Clears Windshield and Warms Car

distributor cap that tests 9,000 volts per mil as against 300 volts per mil for the older style. Unaffected by temperature changes, the cap is moisture proof and crack proof and not likely to permit high-tension current to short externally on a damp morning. It has an adjustable air gap where each high-tension wire fits into the gap, a special key being used to adjust the gap. A quarter turn of the key adjusts to a minimum of six one-thousandths. Greater control over ignition between distributor cap and spark plugs is therefore provided.

Freedom from tire changes on the road is made possible by a special tire guard that looks like a hubless, spokeless inner wheel welded to the wheel rim. Should a tire go flat, the car is prevented from dropping to the rim. Instantly the tire guard takes up the job of supporting the car. It also is possible to install self-sealing tubes that carry a semi-liquid compound which fills any break in the rubber and seals it against air leakage. Closely





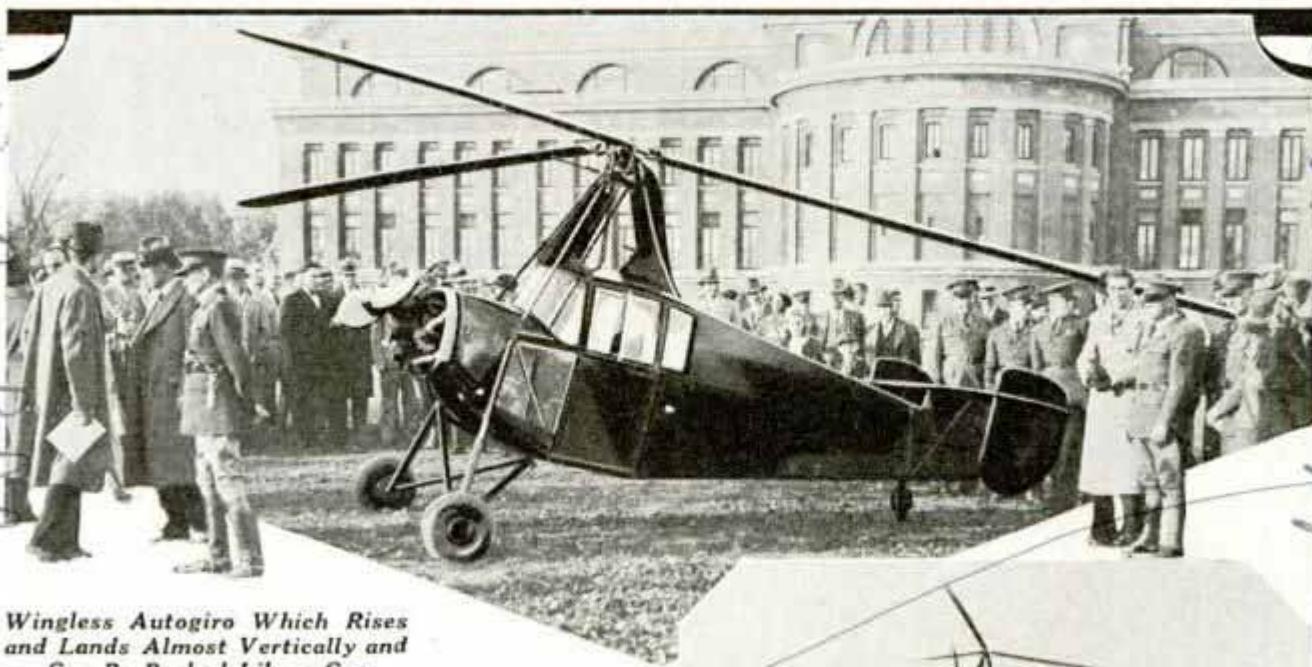
minimum of braking power. This is made an easy rule to follow in the case of those cars which were factory equipped with vacuum assistance regulated from the instrument panel. By using the least

amount of such power it is possible to stop the car without risk of locking the wheels. This gives unusually good security while driving over icy roads.

Among winter comforts may be mentioned an autostat for increasing the generator charging rate by five amperes every time the car's radio is turned on. There are new methods of deflecting heat so that the front-seat passenger is not overheated at the expense of those behind. A real advance is the oil filter which can be cleaned

(Continued to page 120A)

Wingless Autogiro Parks Like an Automobile

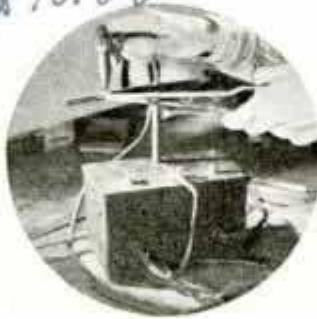


Wingless Autogiro Which Rises and Lands Almost Vertically and Can Be Parked Like a Car

Requiring no more room to park than an automobile, a wingless autogiro was demonstrated recently in Washington. It rises and lands vertically and is capable of hovering virtually at a standstill in the air. The rotor blades can be folded for parking and the machine then can be stored in a garage without trouble. It lands and takes off within twenty-five feet and hence nothing more than a small open space is needed as a landing field.

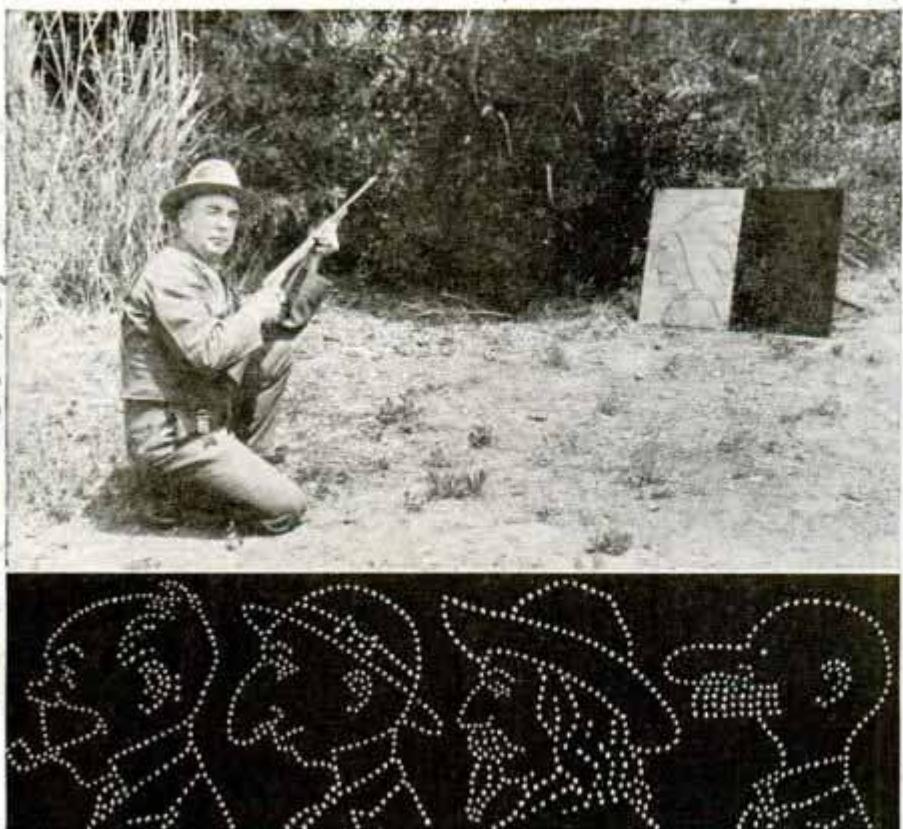
ELECTRIC SOLDERING OUTFIT FOR USE IN WORKSHOP

Although designed primarily for jewelers, a small electric soldering outfit can be put to many uses in the workshop. It consists of a transformer for stepping down the house-lighting voltage to a few volts, with a corresponding increase in available amperage; a foot switch for controlling the transformer, a flexible cable with a spring clamp, and two pointed carbon rods, one of which acts as a stake for supporting work. The transformer has three taps for low, medium and high heat. Low and sometimes medium



are used for soft soldering, and medium for hard or silver soldering. For large articles and for welding small pieces of iron, the high tap is employed. The output through this connection is sufficient to fuse two large nails in a few seconds. There are several ways of directing the electric current so it will produce heat where desired. In some cases the carbon terminals need not be used, resistance of the solder itself creating enough heat to melt it. The transformer is shock-proof, the voltage being too low to be felt.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon receipt of a stamped, self-addressed envelope.



Capt. Hardy "Sketching" an Indian's Head with Bullets, and Examples of Other Figures He "Draws" with the Aid of His Rifle

PICTURES DRAWN WITH BULLETS SHOW SKILL OF MARKSMAN

Drawing pictures with bullets is a hobby of Capt. A. H. Hardy, an expert marksman of California. He makes the sketches on tin-plate targets without the aid of any preliminary trace marks or stencils, using a twenty-two caliber short automatic rifle. He stands about twenty feet from the target, places his bullets about three-quarters of an inch apart and uses about 150 bullet holes to make an Indian head which he completes in about three minutes. He requires but little practice to become proficient in bullet sketching a new figure, such as Uncle Sam, Buffalo Bill or a comic strip character. To make such profiles, however, the marksman must have the ability to sketch with a pencil for he must imagine his lines as he proceeds, just as though he were drawing on paper.

SHIP'S CREW AND AIRPLANE SAVE DISTANT PNEUMONIA VICTIMS

Three victims of pneumonia in Alaska probably owe their lives to the ingenuity of a ship's crew and the speed of an airplane. Several months ago the U. S. S. "Wright," cruising in Alaskan waters, re-

ceived a wireless request from a hospital at Ketchikan for a cylinder of carbogen, a mixture of oxygen and carbon dioxide, needed within twelve hours to administer to three patients suffering with pneumonia. The nearest supply was at Seattle, 600 miles distant and it was too late in the day for a plane to start on so hazardous a journey. The boat had no carbogen aboard but it had the ingredients in the form of oxygen used for oxy-acetylene welding and carbon dioxide used for charging fire extinguishers and for refrigeration purposes. The medical officer knew the right proportions for mixing and the chief machinist

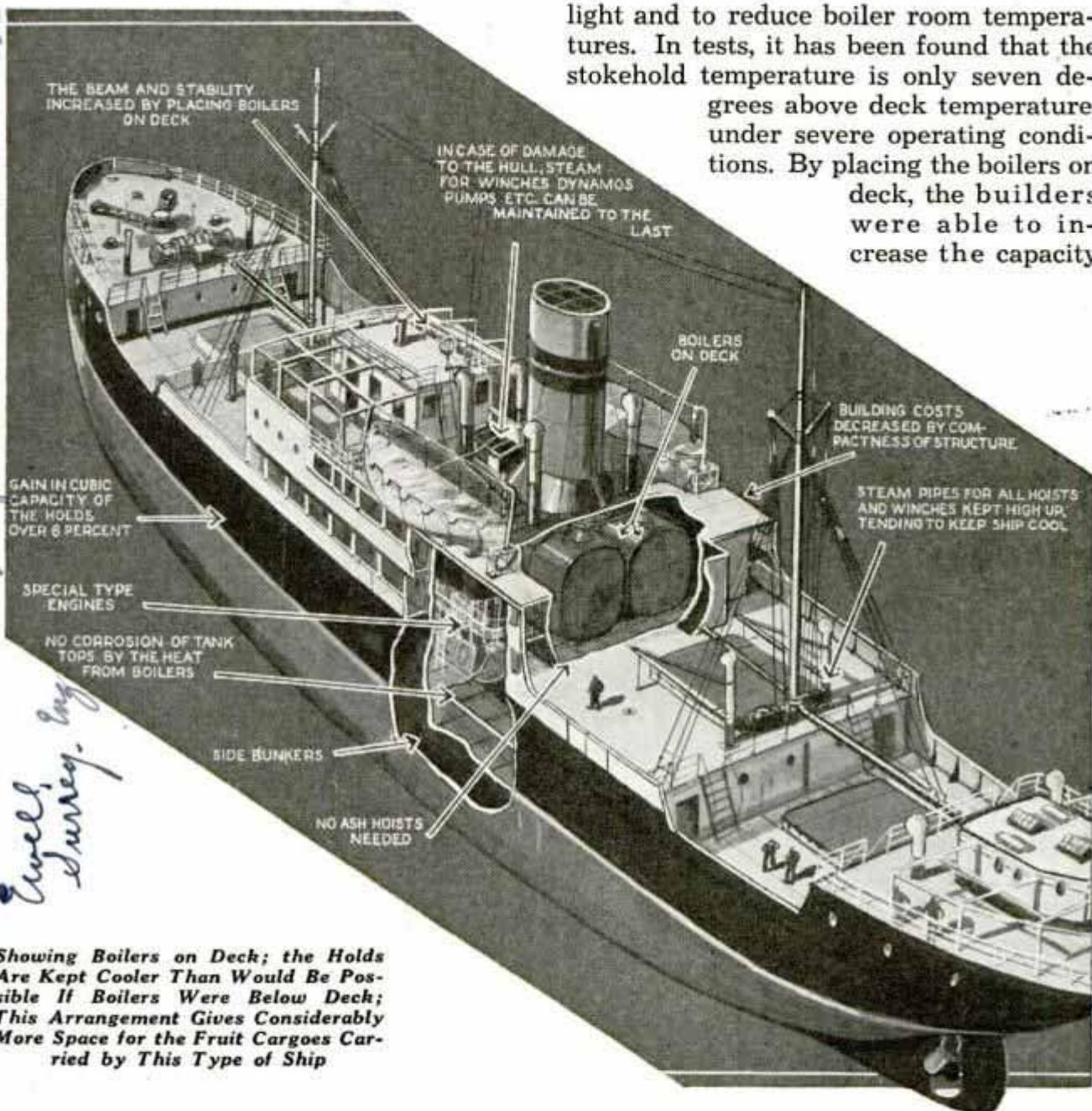
knew how to mix the inert gases, so the vessel was converted into a laboratory. It was headed for a wooded island near the mainland and anchored in the lee, out of the wind. A steam fitter connected the two cylinders with a flexible tube, then an electrically driven charger was brought out. Enough oxygen was emptied from one cylinder to make room for the carbon dioxide and the latter was pumped in. A



Members of Ship's Crew Making Carbogen by Transferring Carbon Dioxide to Oxygen Cylinder

seaplane made the 100-mile trip from Ketchikan to the boat and was back at the hospital with the cylinder in two hours.

Cargo Kept Cool on Ship with Deck Boilers



Showing Boilers on Deck; the Holds Are Kept Cooler Than Would Be Possible If Boilers Were Below Deck; This Arrangement Gives Considerably More Space for the Fruit Cargoes Carried by This Type of Ship

Protection of cargoes against the high temperatures of the tropics is accomplished by placing on deck the boilers of the latest fruit-carrying freight ship. In addition, the stokeholds are above the water line, making it possible to admit plenty of air and

light and to reduce boiler room temperatures. In tests, it has been found that the stokehold temperature is only seven degrees above deck temperature, under severe operating conditions. By placing the boilers on deck, the builders were able to increase the capacity

of the holds by more than six per cent. With the power plant in this position, steam can be maintained for pumps, steering gear, winches and dynamos in emergencies such as damage to the hull. The ship is equipped with refrigerating apparatus.

Non-Poisonous Gas Now Supplied for Heating Purposes

Through a process recently developed for removing the carbon monoxide in gas for illuminating and heating purposes, a non-poisonous form of gas is being supplied to one town in Germany. It is said the process does not affect the value of the gas for heating or illuminating purposes

and does not increase production costs materially. Previous processes have involved disadvantages such as impairing the heating qualities. The new process for removing carbon monoxide is also said to eliminate traces of other elements harmful to pipes and other gas equipment.

D 13 72
cont. John L. County, 3/10/7-1931
D. C. Washington

UNCLE SAM - 10¢

and Robert L.
Cochrane

Government Research Station
Washington D. C.

Mesh Marketing Bag Which Permits Housewife to See Sacked Potatoes and Other Vegetables or Fruit

EVERY day in Washington, for several months, a government scientist mounted to the roof of one of the federal buildings and devoted an hour or two to rambling about in the broiling sun, peering into glass containers filled with such things as butter, salad oil, lard, potato chips, mayonnaise and other food products.

This particular scientist, Mayne R. Coe, of the ~~federal bureau of chemistry and soils~~, was trying to find out something about rancidity in foods and what could be done about it. In the experiments, now concluded, he used different colored glass containers and flasks. Alongside each of the colored containers he had a check one of clear glass. He had butter in a grass-green container and butter in a clear glass container; lard in red or yellow container and lard in a clear container.

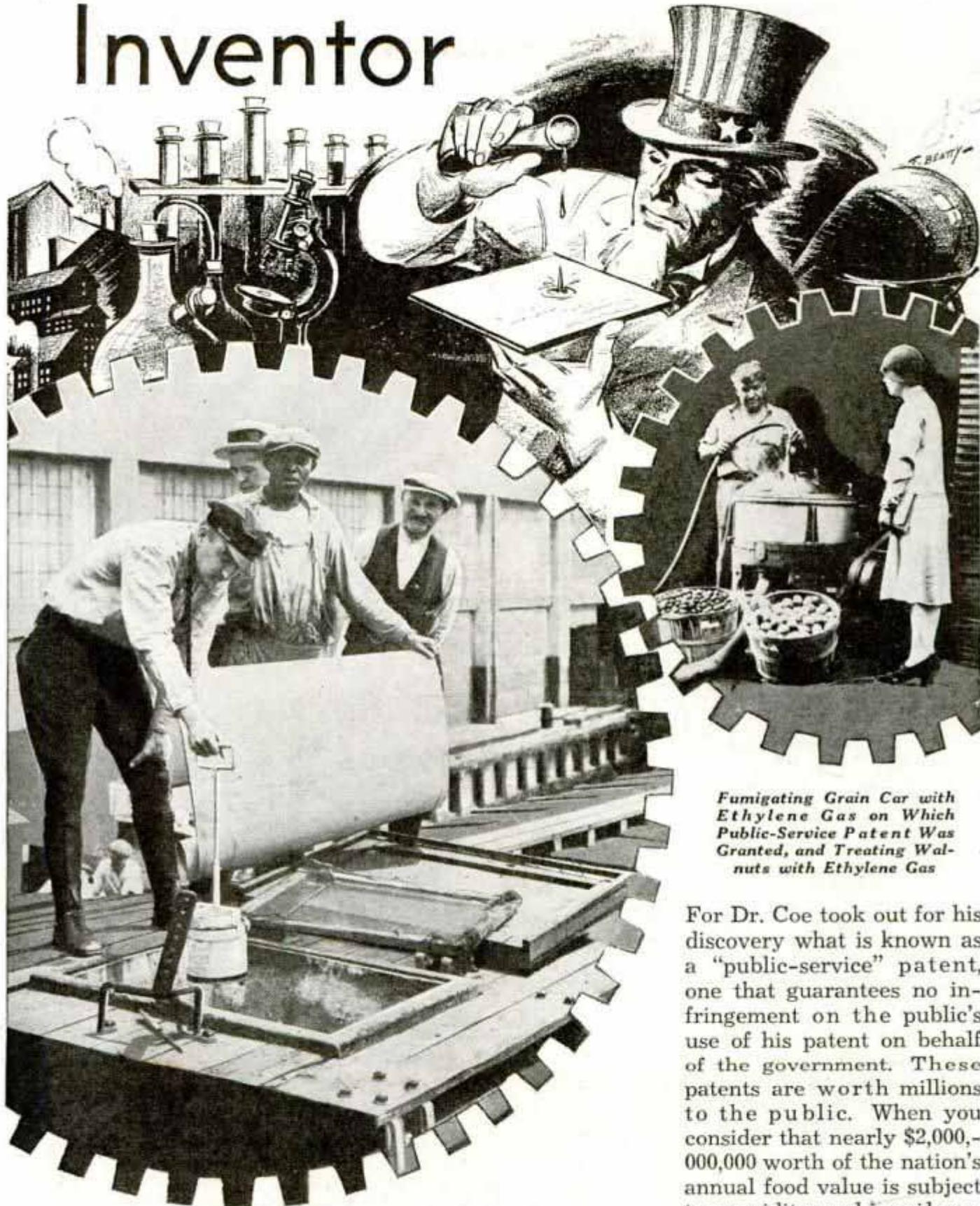
In each instance, Mr. Coe found, where grass-green glass was used the food did not grow rancid; but

Green "Cellophane" Bag to Keep Potato Chips Sweet, and
Moth-Proofing Furniture with Fumigant Developed by Gov-
ernment Scientists

DIS92

FEB 19

Inventor



Fumigating Grain Car with Ethylene Gas on Which Public-Service Patent Was Granted, and Treating Walnuts with Ethylene Gas

where other colors were used, it did. In other words, he discovered that food packages of grass-green color prevent rancidity.

This is but one of a long list of discoveries and inventions made by federal scientists which have become the property of every American citizen for the asking.

For Dr. Coe took out for his discovery what is known as a "public-service" patent, one that guarantees no infringement on the public's use of his patent on behalf of the government. These patents are worth millions to the public. When you consider that nearly \$2,000,-000,000 worth of the nation's annual food value is subject to rancidity and spoilage, and that this can be curtailed by using grass-green containers, you begin to see the value of such a discovery as that of Dr. Coe's.

Recently E. M. Chace and D. J. Sober of the federal fruit and vegetable chemistry laboratory at Los Angeles, Calif.,

D 1372

Matheson Co., Inc.
333 Patterson Place, Newark, N.J.



Left, Experimental Laboratory Where It Was Found Grass-Green Containers Prevent Rancidity in Foods; Below, Spring Attachment Which Prevents Game Trap from Catching Small Animals; Bottom, Model of Cotton Dryer Developed by a Government Engineer

demonstrated that the use of ethylene gas in walnut hulling speeds up the removal of husks from "stick tight" nuts and thus prevents the development of amber or brown kernels which sell at a large discount. So valuable is this discovery that the granting of a public-service patent application, now pending, means, without cost to walnut growers, an annual increase of about \$375,000 in their income by cutting down the percentage of bad kernels in a year's crop.

Ethylene gas also is used in treating fruits and vegetables after harvesting to hasten completion of certain natural processes. This development is also credited to an agricultural scientist, Dr. F. E. Denny, of the department's Los Angeles laboratory. By experimentation he discovered that ethylene, a by-product of kerosene combustion, softened hard pears.

The result was a public-service patent taken out by him and available to every one. Now pears are treated with ethylene to soften them uniformly and quickly. This means that in five or six days they can go directly from cellar to preparation room in canneries, saving from one to two dollars a ton in sorting cost. Several varieties of apricots are also treated this way,

D1392

as are bananas and tomatoes. Ethylene gas decreases the acid of tomatoes, giving them a sweeter taste.

The gas is also used successfully to fumigate dried fruit, packaged cereals and nuts. It prevents multiplication of insects and consequent deterioration. The treatment is also valuable for raisins and is being extended to other products, such as tobacco, stored silks, wool textiles and upholstered furniture. The gas, which is free from fire and explosion hazard when used according to directions, is deadly to insects, but comparatively harmless to man and does not appear to leave on the materials obnoxious odors or residues.

A patent on a wild game trap attachment was granted recently to Albert M. Day of the biological survey, in the interest of the public. This attachment, a small, detachable, thin steel spring to be inserted between the pan and the base of a standard steel trap, saves smaller animals from being caught in traps set for wolves, coyotes and other predators. As an animal puts about one-third of its body weight on a foot when walking the attachment can be adjusted to spare from the trap, rabbits, porcupine, badgers and other small, inoffensive creatures.

Another public-service patent was granted R. B. Gray and L. G. Schoenleber, of the bureau of agricultural engineering. It is a pick-up attachment for corn pickers, corn binders and other row harvesters, and means cleaner cut cornfields, a larger percentage of grain and fodder harvested and, consequently, greater insect control, especially of the corn borer. Steel fingers on an endless chain sweep the ground as the harvester passes through the field and gather to the machine for binding stalks on the ground or stalks twisted awry.

A public-service patent is now out covering a process for removal of poisonous spray residues from fruits and vegetables. It is in the name of Arthur M. Henry of the department of agriculture and consists essentially in the removal of spray residues by washing the fruit or vegetables with dilute alkali and acid solutions, followed by rinsing and drying. It does away with the old wiping method.

As a result of experiments with soaking and parboiling rough rice before milling,

(Continued to page 142A)

John. Williams
es. Williams

D1451

Los Angeles
Calif.

Canned Vegetable
Both Hands Are Left Free When Telephoning by Using This Standard to Support the Instrument

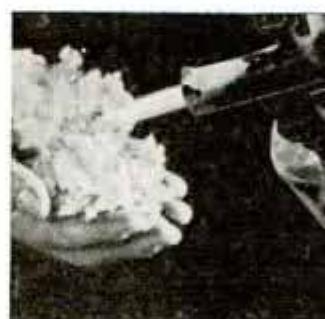
SUPPORT FOR PHONE LEAVES BOTH HANDS FREE

Both hands are left free for making notes, typing or referring to memoranda while telephoning if the instrument is supported on a standard developed by a California woman. The support is so arranged that when the mouthpiece is brought into position for speaking, the receiver rests against the ear.

D1496

ROCK WOOL RESISTS FIRE

Material that resists the heat and flame of the blowtorch is being used as insulation by building contractors.



Called rock wool, it originally was molten rock. Blown with a jet of steam in a furnace, the molten rock turns into a substance closely resembling fine spun wool. Scientists first found it in Hawaii, blown from the volcano Kilauea. Placed in hollow wall spaces, it reduces fuel bills in winter and keeps the home cooler in summer.

John. Williams
es. Williams
Los Angeles
Calif.

D1358.



Top, Close-Up of "Chisel" Plow; Bottom, the Plow Drawn by Tractor to Cultivate Field

"CHISELING" PLOW DIGS DEEP TO COMBAT DROUGHT

Farmers are being offered a method of combating drought effects. It is called "chiseling" the soil. A homemade plow that digs a deep furrow is used to scratch down to the hardpan and bring it to the surface in flakes. There the hardpan mixes with the dry, loose topsoil, keeping the powdery surface from drifting and being blown away. Success of the method is attested by the 1934 harvest on an Oklahoma farm with an average of twenty-eight bushels of wheat per acre compared to three or four bushels per acre on neighboring farms. The plow was used to dig furrows about forty inches apart, ten to sixteen inches deep and only three inches wide. This stopped drifting of the topsoil. When one of the few rains of the season came, the water disappeared into the narrow furrows instead of running off into roadside ditches and carrying the soil with it. Thus, very little of the precious water escaped from the field. In-

stead it remained in the ground to nourish the growing wheat through weeks when no rain fell. The "chisel" plow can be made in any blacksmith shop at small cost. An ordinary strip of steel sixteen inches long, three-quarters of an inch thick and about three inches wide is used. Its end is sharpened but not pointed. The steel strip is then curved to fit a lister beam from which the moleboard and frog have been removed, the point protruding about three inches below the point of the lister beam and held in place by four bolts. The plow can be used before or after any type of planting and if the ground is chiseled deep enough every drop of rain will soak in. To get the best results, the furrows should be run as soon after harvest as possible. The field is run "one way" soon after the harvest and "one way" again before sowing.

D1444.

FACTORY-MADE FLOOR BLOCKS ARE EASY TO LAY

Patterned hardwood floors can be laid quickly and inexpensively by using tongued-and-grooved floor blocks finished at the factory and ready for laying. The blocks are composed of strip flooring fabricated into a single unit by means of



Laying Tongued-and-Grooved Patterned Hardwood Floor Blocks Finished at the Factory

steel splines. The blocks are sanded, filled, finished, waxed and polished at the factory and can be laid over wood sub-floors or old wood floors. They have three shades

C.L. Bruce

Memphis Tenn.

Memphis Tenn.

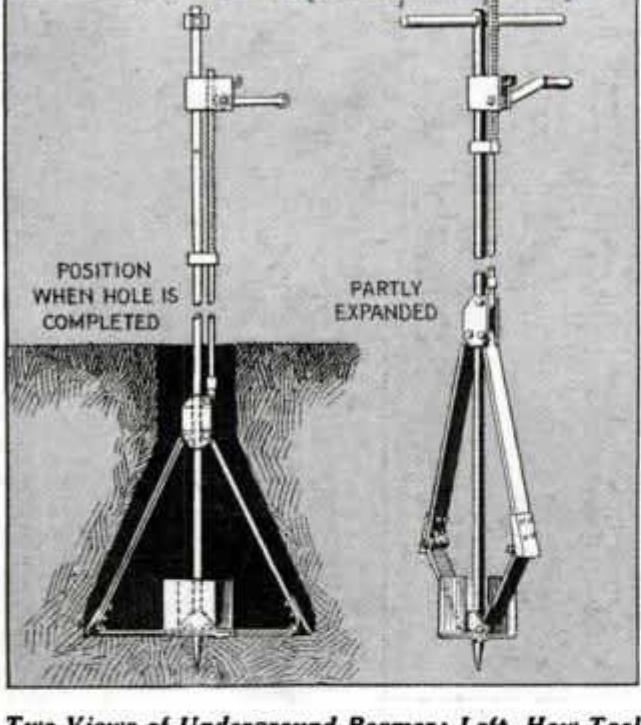
Co., 1012 San Jacinto Blvd.

of finish, natural, medium and dark, and unusual effects are obtained by working out geometric designs, using all three shades and possibly two or three kinds of wood in the same floor. The shapes of the blocks vary, so an infinite variety of patterns is possible. The blocks are available in oak, maple, beech and walnut in several grades and sizes.

Beaumont Tex D/386

REAMER DIGS OUT POST HOLES FOR FILLING IN CONCRETE

For increasing the bottom of a hole bored by a post-hole type auger, a new machine has been introduced. With this underground reamer, the hole can be excavated at the bottom to the size desired for filling with concrete to make a firm foundation. Concrete forms can be eliminated, together with about fifty per cent of the cost of excavation and back fill. The amount of concrete used is said to be decreased about one-half, in comparison with the old type of spread footings. The



Two Views of Underground Reamer; Left, How Tool Enlarges Bottom of Post Hole

reaming is accomplished by causing bottom blades on the tool to spread after the reamer has been inserted in the post hole.

Ocean temperatures, with other factors, may form the basis for long-range weather forecasting along the Atlantic coast.



Three Views Showing How Metal Top Folds into Rear Deck of Latest European Automobile

DISAPPEARING TOP ON AUTO WORKED BY PUSH BUTTON

Operated by a push button conveniently located on the dash, the metal top of one European automobile folds back into the rear deck. Reversing the operation causes the top to rise into position. When housed in the rear deck, the top is completely concealed. Hidden mechanism raises and lowers the top, which is gracefully shaped to conform to the streamline effects introduced by the body designer.

JOLTS TO FREIGHT SHIPMENTS RECORDED BY CLOCK

Can manufacturers are placing jolt recorders in freight cars to show the jarring and jolting suffered by cans in shipment. If the jolts are severe enough to damage the cans, a clock records the time the damage was done and from this time, the place where the damage occurred can be figured, thus giving the shipper data for determining responsibility for the damage, which is important where a shipment is traveling over several railroads to its destination.

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D 1332

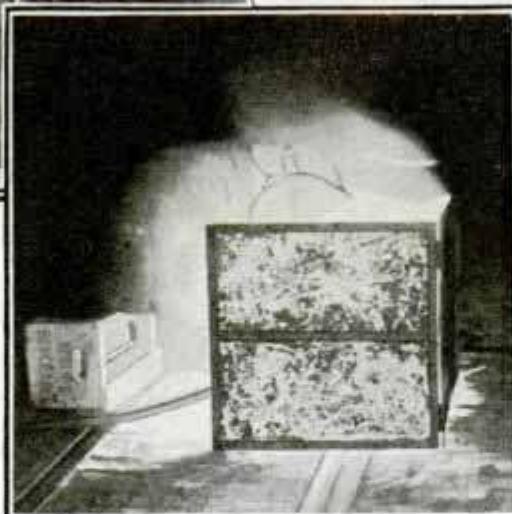
Cont. of Thomas Vincent Welch
2332 Maryland Avenue

Unsung HEROES of EVERYDAY Life



Washington
DC

Above, Despite the Heavy Gloves and the Mask, This Welder Faces Many Hazards Day after Day; Right, Night Scene of Welding Work in Street behind Protective Screen



Sparks from the Welder's Torch Constantly Expose Him to the Danger of Bad Burns and the Work Is Hard on the Eyes Despite the Dark Goggles the Welder Wears

IT takes nerve to handle a welder's torch. Sparks fly. Eyes must be protected with dark goggles. Hands must be covered with leather gloves.

And even then there is always danger of bad burns in handling that flaming acetylene torch, so hot that it melts steel like ice in the summer's sun. When a spark of molten metal flies into his clothing, the

welder must remember to turn off the gas from his spouting flame before he puts out the fire burning his overalls. Half his clothes may be burned away before he can care for all the details of safety.

There is also another hazard. If a spark such as burns his clothes should hit the hose and get into either the oxygen or acetylene tanks, there wouldn't be much

left of the tanks or of whoever the pieces hit. There are from 2,000 to 2,800 pounds of pressure on one tank and from 800 to 1,200 pounds on the other. And even with smoked goggles, the welder's eyes suffer. He is almost blind for a few minutes after working for half an hour with the torch.

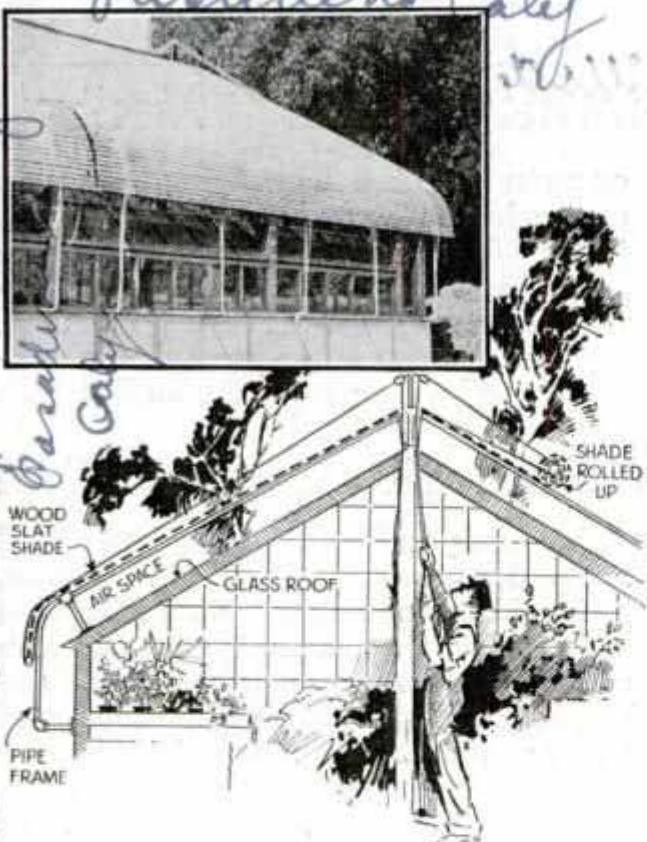
The man who wields the squirming tubes and fiery torch, however, takes all these risks cheerfully as part of the job. He complains most of all about the wear and tear on overalls and wonders why some inventor hasn't turned out a work suit of armor for his use.

D/330

ROLLING SHADE ON GREENHOUSE SHELTERS DELICATE PLANTS

At the California Institute of Technology, a rolling shade has been placed on the roof of one of the greenhouses to shelter delicate plants from the direct rays of the sun. It consists of wood slats made into a Venetian blind and can be rolled

Pasadena Calif



Rolling Shade Which Shelters Delicate Greenhouse Plants; Note the Pipe Framework

down to shut out the sun or rolled up when more light is required, moving over a pipe frame set a foot above the glass roof to form an air space when the shade is extended.



Small-Scale Plant for Taking Mercury from Ore; Its Efficiency Is Said to Be High

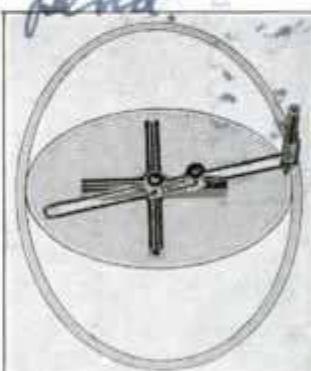
MODEL MERCURY ORE PLANT IS HIGHLY EFFICIENT

Increased recovery of mercury in ores is claimed for a new process and apparatus, a model of which has shown efficiency of 99.85 per cent. The plant will be produced on large scale at a California mine. The process causes sulphur, which usually is found in mercury ore, to unite with oxygen, forming sulphur dioxide, leaving a residue of pure mercury. This obviates the necessity for redistillation.

D/380

DRAWING OVALS IS MADE EASY WITH SIMPLE INSTRUMENT

Making an ellipse has always been difficult for draftsmen, but such work is simplified with an oval-making instrument which can be used with a pen or pencil and enables anyone without previous experience to draw a true ellipse. It consists of a metal frame on which is placed a guide for the pen or pencil. This guide can be adjusted to form ellipses in many sizes and shapes and in single, double or tint lines.



Rich Art Color Co. Inc.

News Carrying Pigeons Aid Japanese Press

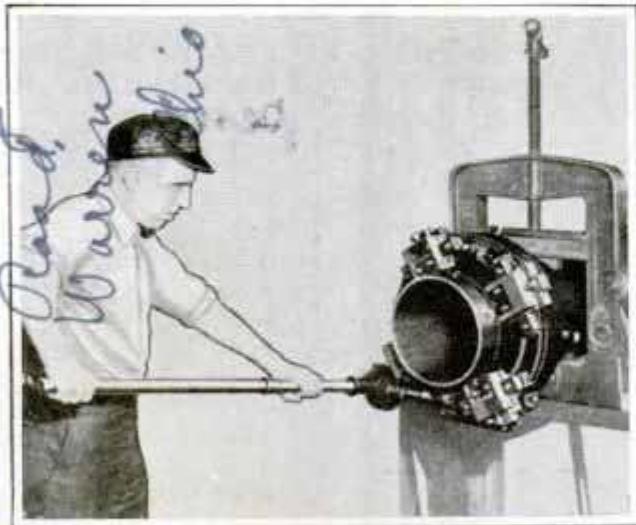


Wade World
Left, Writing Bulletins to Be Carried by Pigeons, Shown in Cages; Right, Pigeon with Cartridge of Exposed Film Tied to Its Back, and News Bulletins to Be Carried in Container on the Bird's Leg

Latest news and undeveloped photographic film frequently are rushed from the scene of a big event to Japanese newspapers by pigeons. The birds have been found a handy substitute for telegraph and telephone, being sent winging to headquarters with the latest scores of games

or news bulletins. This flying messenger service has been operated successfully between Yokohama and Tokyo. Exposed film is placed in a case resembling a fountain pen and attached to the bird's back, while news reports are carried in aluminum capsules fastened to the bird's legs.

Twelve-Inch Pipe Is Cut by Hand with Compact Tool



Wade World
Hand-Operated Tool Which Cuts Pipe Up to Twelve Inches in Diameter

It is now possible to cut standard or odd size pipe, up to twelve inches in diameter, by hand without undue manual effort with the aid of a compact cutter equipped with a set of knives for square end cuts, another set for grooves and a third set of beveling knives to prepare pipe ends for welding. The knives are fed automatically by powerful springs, and safety guides, riding ahead of the cutting edges, make it impossible for them to dig in. Four grip screws hold the tool on the pipe and the cutting head is revolved by means of a driving pinion in connection with a worm gear. A long handle, working on a ratchet, gives leverage. The knives can be resharpened when dull.

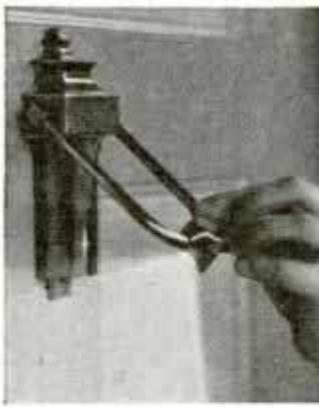
The Knocker Lit Co.

RARE GASES IN ELECTRIC BULBS INCREASE THEIR EFFICIENCY

Some of the rarest gases of the atmosphere soon will be in every home in pure form. They will be found in electric-light bulbs which will be more efficient for their presence. First the bulb contained a partial vacuum, then it was filled with nitrogen, and now argon is used, the efficiency of the bulb increasing with each change. Now since two of the rarest gases of the atmosphere—xenon and krypton—can be produced commercially, they will replace argon and it is estimated bulbs filled with them will be one-third more efficient than those containing the argon. There is only one part of xenon in 11,000,000 parts of air and one part of krypton in 1,000,000 parts of air. In order to obtain one pound of xenon, with ideal apparatus, it would be necessary to process about 1,208 tons of air.

SMALL LIGHT IN DOOR KNOCKER HELPS FIND KEYHOLE

Fumbling in the dark for the keyhole is unnecessary if the door is equipped with a knocker containing a small light concealed in the hammer. When the hammer is raised, a circuit is closed and the lamp lights, the rays being thrown obliquely downward, illuminating the entire area around the lock. The light is operated by two small batteries held in a metal case within the main portion of the knocker. Batteries can be replaced by removing only one



screw. The light bulb is well protected so it will not break when the hammer strikes the knocker section.

BOY'S HOMEMADE TELESCOPE HAS HIGH POWER

Costing only about \$12 to build, a reflector telescope constructed by a Wisconsin boy has high power. It is possible to read the headlines of a newspaper a mile away by using the homemade instrument.

John P. Berkeley



Homemade Telescope in Builder's Backyard; Its High Power Makes Study of Stars Interesting

Piece of stovepipe, spare automobile parts and plate glass were used in building the telescope, which boasts an eight-inch mirror and hand-ground reflecting lenses. The builder has found it efficient in his study of the stars.

D/394

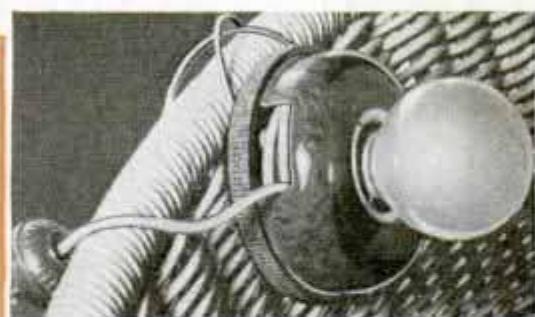
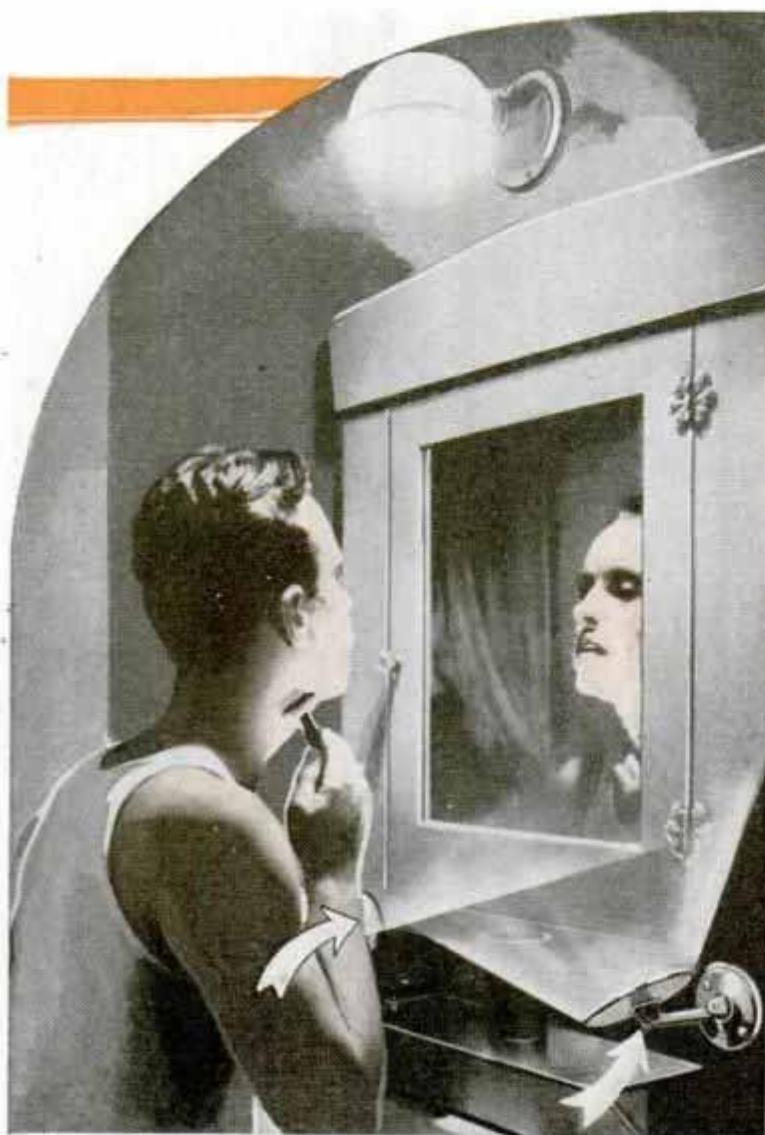
INK PUMP ON FOUNTAIN BRUSH CONTROLLED BY BUTTON

Sufficient ink for stenciling is maintained in a new fountain brush by pressing a button that regulates the flow from the built-in ink pump. The handle and head are cast in one piece of aluminum, with the end of the hollow handle closed by a threaded brass cap. The brush is filled by removing this cap.



*ideal stencil
machine Co. 113*

LATEST



Left, Twin Mirrors for Dressing Table or Bathroom Mirror Which Fasten to Wall or Stand on Shelf and Reflect the Light on the Face for Applying Powder or Shaving; Above, Electric Connection with Extension Cord on Reel for Lamp, Iron, Toaster or Curling Iron; Note the Flexible Wire Clamp



Above, Aluminum Kettle with an "Elbow" in Handle and a Flap over Strainer in Cover Which Opens Automatically for Draining; Right, Electric Mixer with Motor beneath Bowl Where No Oil or Grease Can Drip into Food; It Can Be Used for Whipping, Beating, and Extracting Fruit Juices

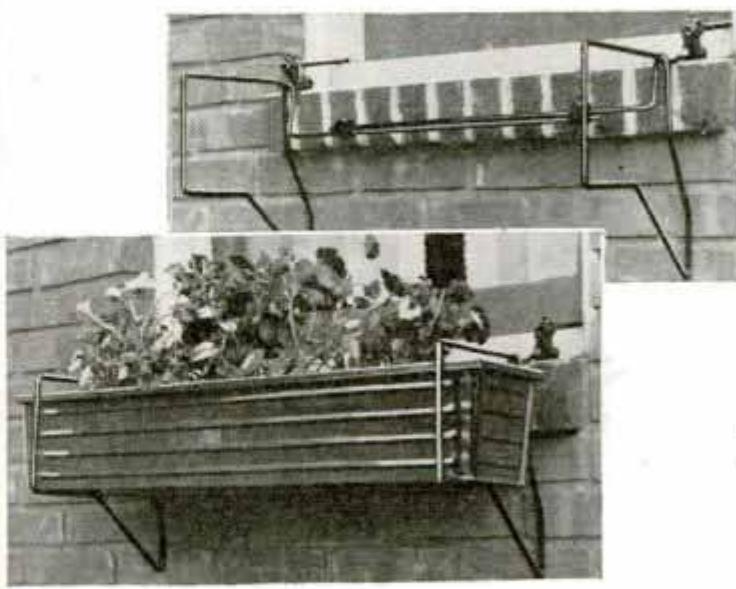
HOME ACCESSORIES



Above, Wall Hanger for Electric Iron, Stand and Cord Which Eliminates Danger of Ruining Smooth Ironing Surface When It Is Not in Use; Below, Cookie Former with Plier-Type Handle Which Presses Dough through Forming Disks; It Can Be Taken Apart for Cleaning



Above, Oil Burner Which Can Be Attached to Ordinary Coal Range; It Consists of a Compact Burner and a Blower Operated by a Small Electric Motor



Above, No Nails or Screws Are Required to Attach This Adjustable Flower-Box Frame to the Window; It Fits Any Size Window and Can Be Mounted or Taken Down in Two Minutes

D 1374



Acme
Flat Car Containing Two Turntables, Each Accommodating a Semi-Trailer Milk Tank Which Can Be Attached to a Truck

MILK CAR HOLDS TWO TANKS USED AS TRAILERS

By means of coordinated rail-highway movement, the cost of transporting milk from producing areas to consuming centers is expected to be cut with the aid of new type milk cars recently demonstrated. Each unit consists of an all-steel flat car containing two turntables on which two insulated milk tanks, each holding 2,100 gallons, are placed. Each tank is equipped as a semi-trailer. Upon reaching the destination, the turntables are swung to positions at right angles to the flat car and a tractor removes the trailers which roll onto a platform level with the turntables. The milk can then be hauled direct to the receiving plant in the original tanks which carried it by rail.

D 1400 TIME SWITCH NEVER FORGETS TO TURN CURRENT ON OR OFF



An animated electrical switch housed in a moisture-proof case turns on or off almost any electrical device at any time within five hours and a larger unit operates at

any time within ten hours. A pointer is set at the desired time and the switch is turned to the "on" or "off" position after which the device does the rest without

m. H. Rhodes, chm.
Identified Company

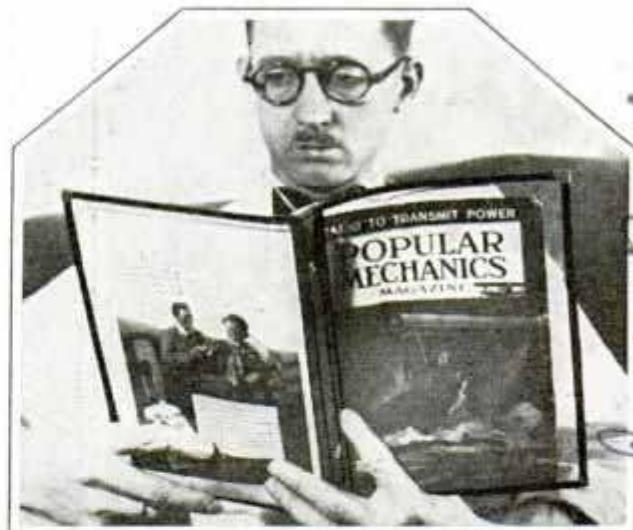
further attention. With the proper apparatus, it can be used to close the garage doors and turn out the lights at any given time after the car leaves. It can be used to turn the radio on and off, or it can be operated with the radio to serve as an alarm in the morning. It also makes possible the remote control of the radio set, it turns floor lamps on and off and will "hold the lights" a short time when anyone is leaving the garage, attic, base-

ment or porch. It has also been employed to control flat irons, percolators, defrosters, washing machines and other electrical appliances and merchants use it to turn display lights on and off.

TRANSPARENT MAGAZINE COVER

D 1435 IS EASY TO ATTACH

Magazines can be protected from soiling and tearing without hiding their attractive covers by placing them in folders made of transparent material. The transparent cov-



Acme
Transparent Cover Which Protects Magazine from Soiling and Is Quickly Attached or Detached

ers can be obtained in assorted sizes and can be attached securely to any magazine in an instant and removed just as quickly.

South Dakota's Black Hills have yielded a fossil skeleton of a seafaring dinosaur.

see Nov. 1934
D 1400

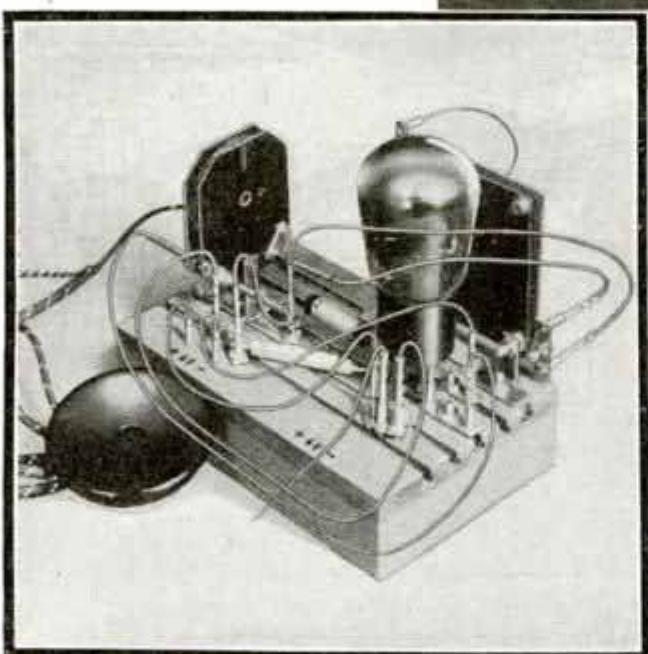
D 4665 Siemens und Halske,
Berlin, Siemenstadt, Germany



RADIO BLOCKS *for Beginners*

SLOTTED wooden blocks and a kit of over one hundred interchangeable radio parts, recently introduced by German engineers, provide an interesting means for instructing beginners. The units can be combined to form hundreds of different radio circuits, which may be dismantled quickly. By actually assembling these parts the user learns fundamental laws as well as the historic development of radio.

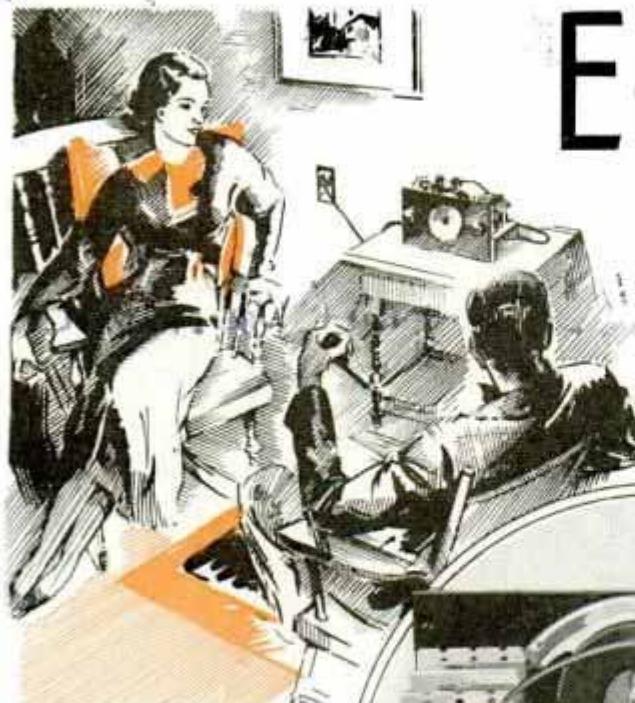
This box of "radio blocks" includes everything from the old coherer, which in radio's



early days was the only means of detecting radio waves, to the latest tubes and modern parts. Experimenters working with the kit will understand something of the pioneer's thrill and satisfaction in starting with the early tests and gradually following up to more ambitious achievements.

Important parts that condensers, coils, resistors and tubes play in various circuits are outlined clearly for the novice in a little book which is supplied with the kit. Passing quickly through the early stages of the art, he learns to assemble simple modern broadcast sets and even receives some instruction on cathode-ray tube circuits employed in television.

ECONOMY

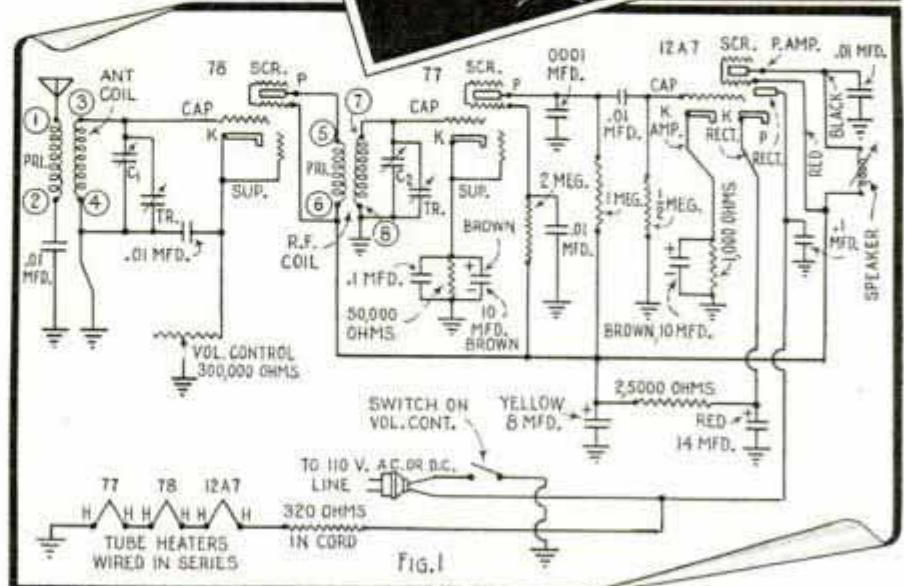
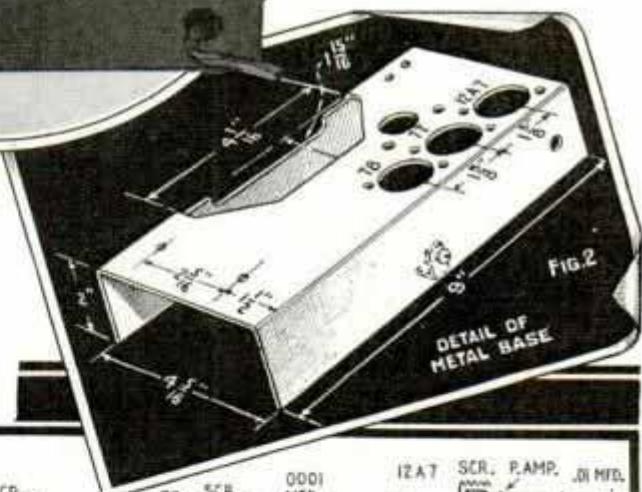
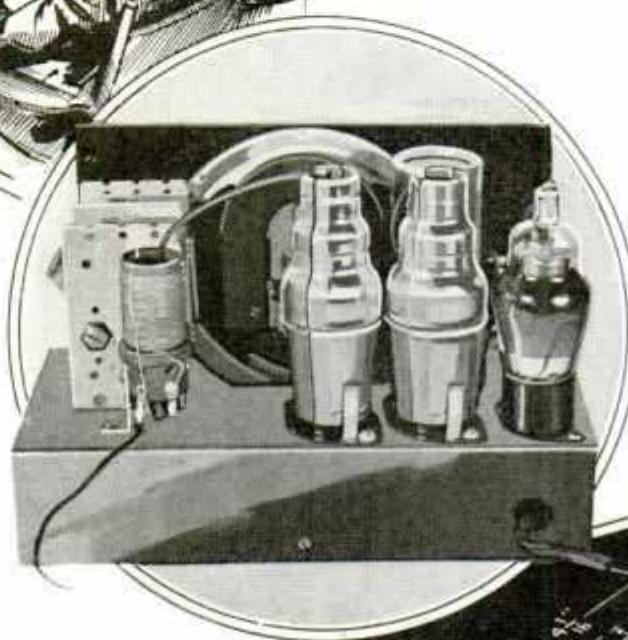


ONLY about \$6.50 worth of parts are required to build this simple up-to-date 3-tube receiver which will operate on either alternating or direct current. Although but three tubes appear on the chassis there are really four, as the new type 12A7 is a combination power rectifier and pentode amplifier. An r.f. stage ahead of the detector accounts for the unusually good performance of this little set in crowded localities, as it provides the necessary selectivity and sensitivity.

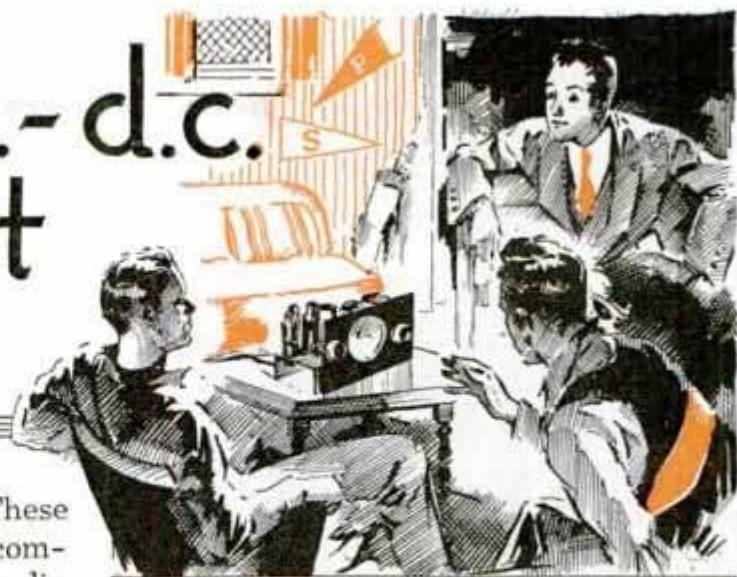
The circuit is a simplified form of the popular Little Giant 4-tube a.c.-d.c. receiver described in the March, 1934, issue. This highly efficient set recently won first prize in a set-building contest held by the Hawthorne radio club, an employees organization of the Western Electric company. Ease of construction and low cost, make the simplified model of the re-

ceiver especially interesting to beginners and those who require a small, easily portable, set for individual use. With a 20-ft. inside antenna, the daytime range is about 150 miles, and stations up to 1,500 miles have been received with good volume at night. The metal base is detailed

in Fig. 2; it may be formed from any suitable sheet metal that can be bent between blocks of wood clamped in a vise. It will be noted that the coil terminals have been numbered in the schematic diagram, Fig. 1, to correspond with those shown in



THREE a.c.-d.c. Broadcast Receiver



the simplified wiring diagram, Fig. 3. These Litz-wire coils are an inexpensive commercial type available from any radio supply house. A complete list of materials may be obtained upon application, without charge. These parts, although few and quite simple, must be of good grade for best results. A cabinet can be used to house the set; however, a piece of scrap bakelite or plywood, 6 in. wide and 8 or 9-in. long, may be em-

(Continued to page 122A)

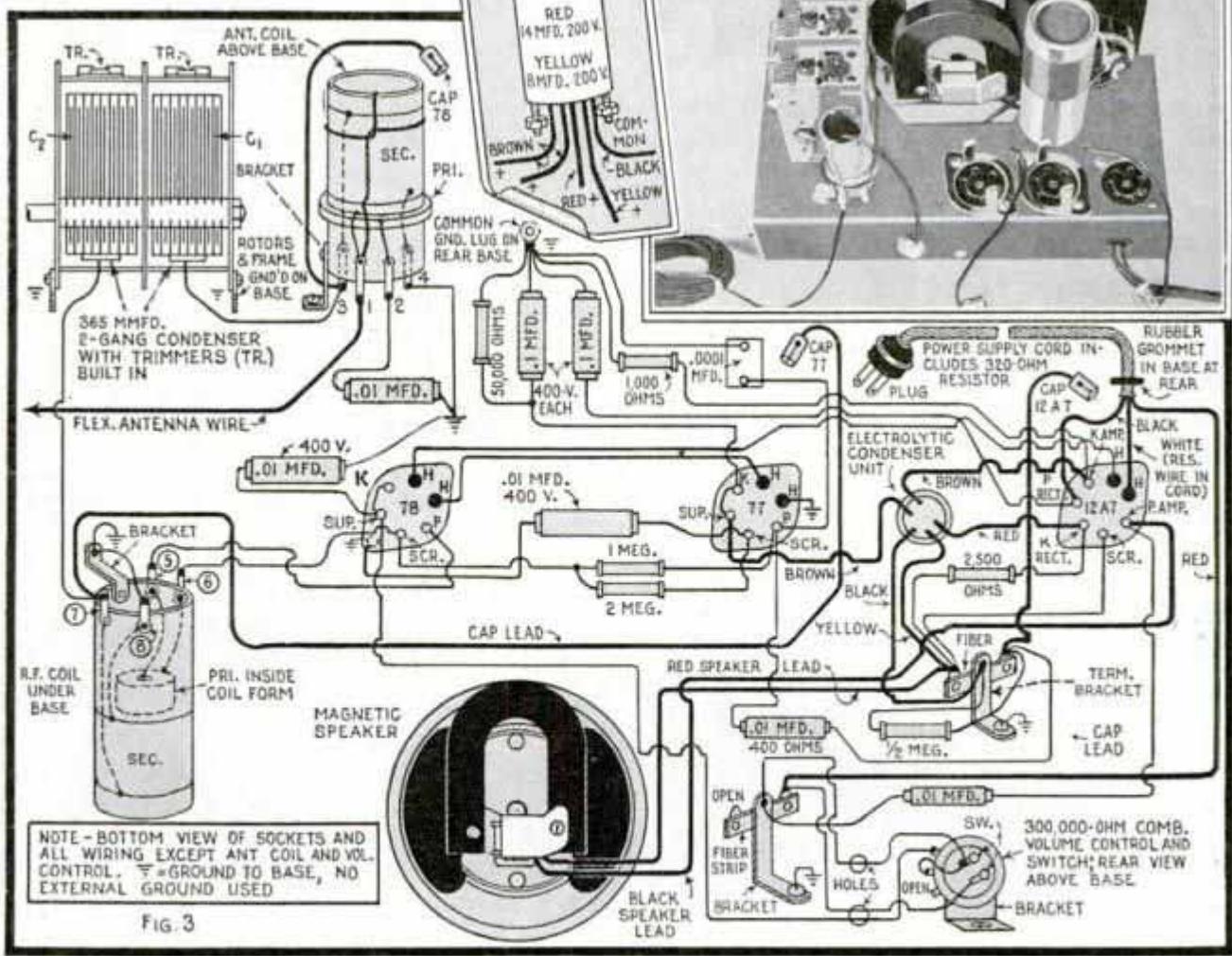
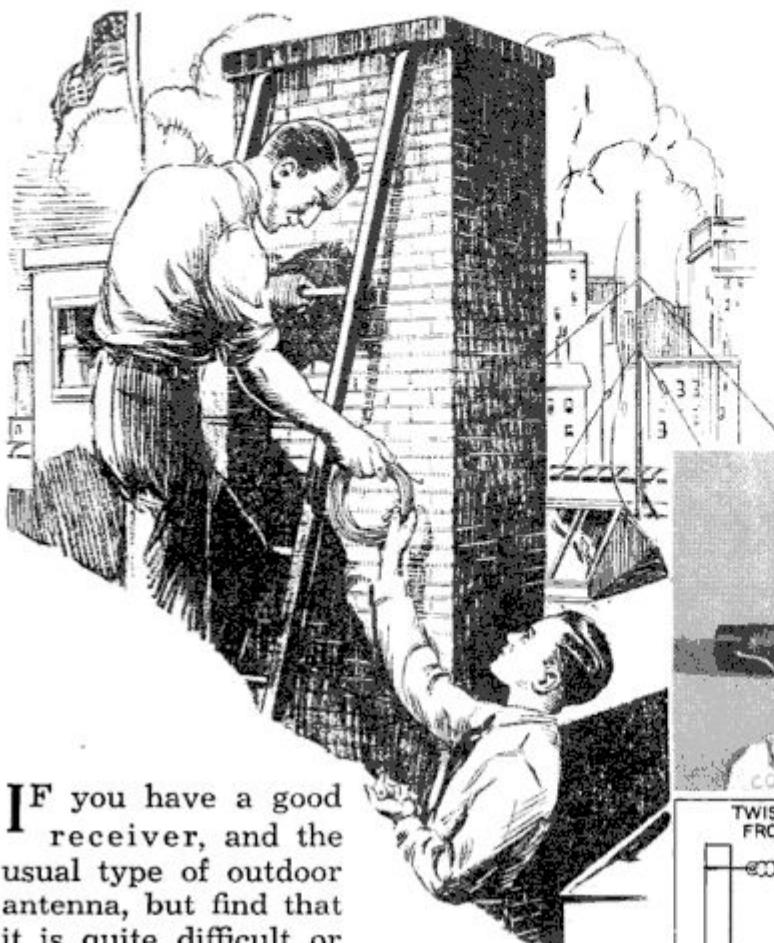


FIG. 3

How to Get Less Noise and More Distance



IF you have a good receiver, and the usual type of outdoor antenna, but find that it is quite difficult or impossible to tune in distant stations, the radio service man will probably tell you that you are in a noisy location. What he really means is that your lead-in wire, which is part of the antenna, is picking up interference from electrically operated apparatus near which it passes on its way down to the receiver. If the antenna proper is located well above the roof, these fields of interference may reach only a small portion of the lead-in. However, the noise level will be raised just enough to bury the distant signals.

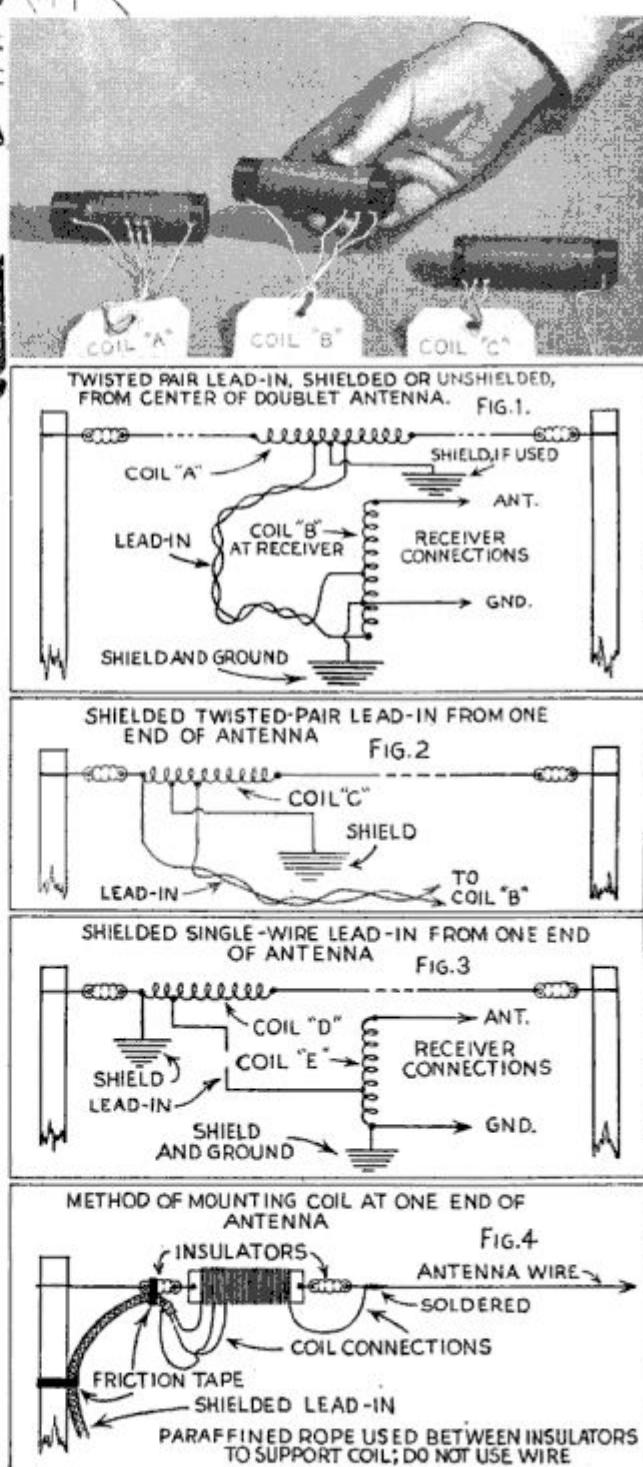
The purpose of this article is to show how to eliminate most of the picked-up interference without losing any of the signal. To do this it is necessary to use what is known as a transmission-line lead-in. This line is coupled to the antenna and to the receiver by means of homemade impedance-matching transformers installed at each end.

The connections to these coils will depend mainly upon the type of antenna used and the variety of transmission-line wire available. Ordinary twisted lamp cord, special twisted and shielded pairs,

and shielded single wires are all suitable for the purpose. If the lead-in is to be connected to one end of the antenna it will be necessary to use a shielded line, while if connections can be made at the center of the antenna any twisted insulated pair may be used, regardless of shielding.

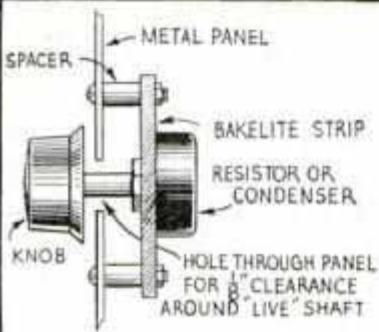
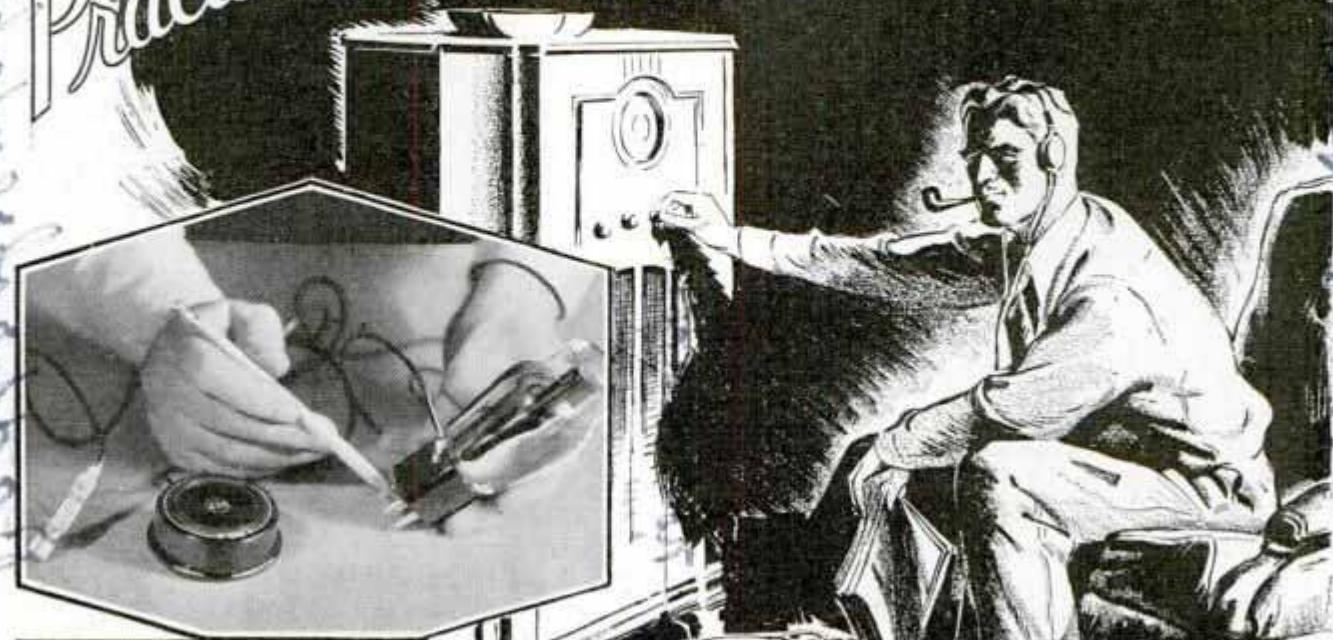
Connections for various types of

(Continued to page 118A)

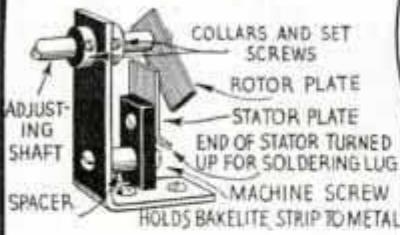


Practical

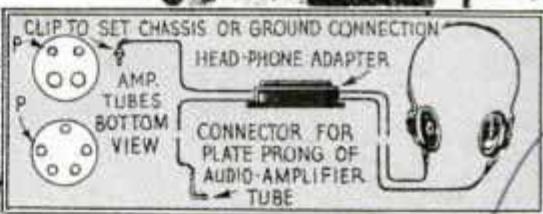
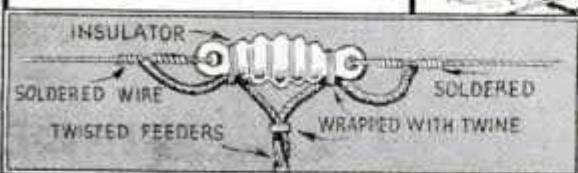
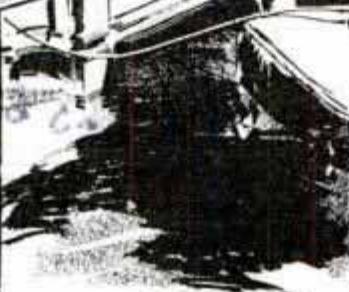
RADIO IDEAS



An Easily Made Mounting for Insulating Grounded-Condenser, or Resistor-Unit Shafts



Above, an Efficient Trimmer or Vernier Condenser Made from Scrap Material; Rotor Plate Is Grounded to Avoid Hand Capacity Effects; Right, Coil Terminals on Cardboard Tubing Quickly Made with Hand Riveting Tool; Below, Ordinary Insulator Used for Doublet Antenna

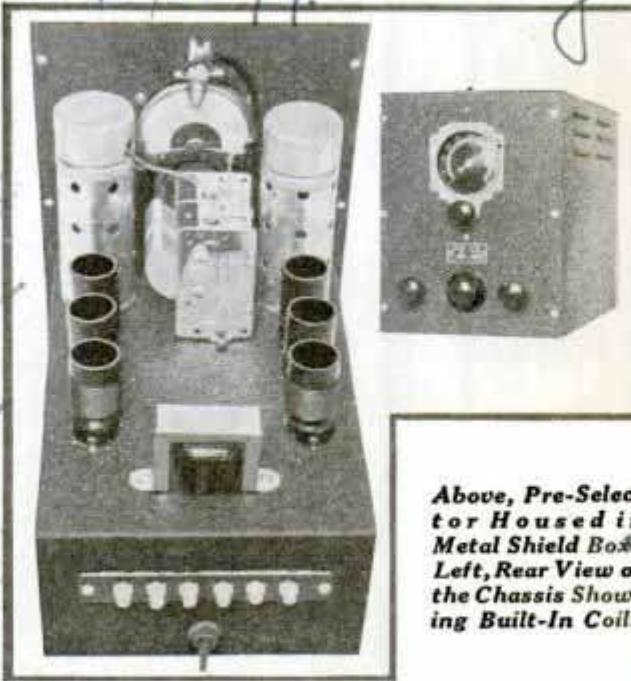


Above, Simple Adapter Enables You to Use Head Phones with Any Type of Receiver; the Thin Metal Connector Slips over Plate Prong of the Amplifier Tube and a Clip Lead Is Fastened to the Metal Chassis at Any Convenient Point; Heavy-Duty Blocking Condenser Protects Phones and Device Does Not Interfere with the Normal Operation of the Set



Tube Leakage and Short Tester; Neon Lamp Glows to Show Defective Tube; Jacks Are Also Provided for Using Tester as Continuity Checker

D4679



Above, Pre-Selector Housed in Metal Shield Box
Left, Rear View of the Chassis Showing Built-In Coils

Pre-Selector for Short-Wave Receivers

With the aid of this high-gain pre-selector, the amateur and short-wave listener can increase the signal strength of weak phone, c.w. and foreign broadcast programs that are now beyond the reach of their present receivers. The unit contains its own filament supply and employs built-in coils covering from 14 to 200 meters. Two type-58 tubes greatly increase the input to any short-wave set. Tested in Popular Mechanics radio laboratory, the results obtained were highly satisfactory. Increased signal gain and sensitivity, together with a material reduction of background noise, enables the user to add many new distant stations to his log.

D4538 Crystal Set Has Pilot Light

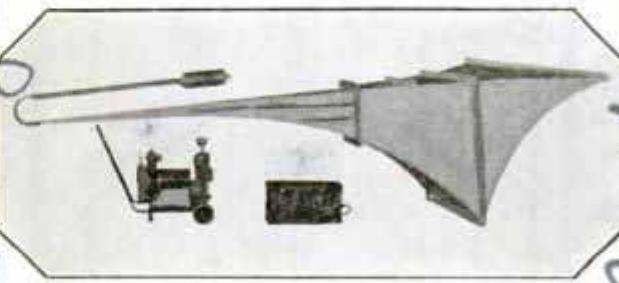
Housed in a bakelite case designed to resemble a midget receiver, this little crystal set has an illuminated tuning dial just like a regular receiver. An adjustable crystal control is operated from the front panel, and headphones are connected below. The receiving range is said to be exceptionally good for a crystal circuit.



Compressed Air Adds Volume

D4669 to Loud Speaker

A tiny air compressor aids in building up sound volume for this loud speaker recently developed in Germany. Instead of using expensive audio amplifiers, the device is said to require only 3 watts, or a fraction of the usual audio output. The valve that releases the compressed air is magnetically controlled.

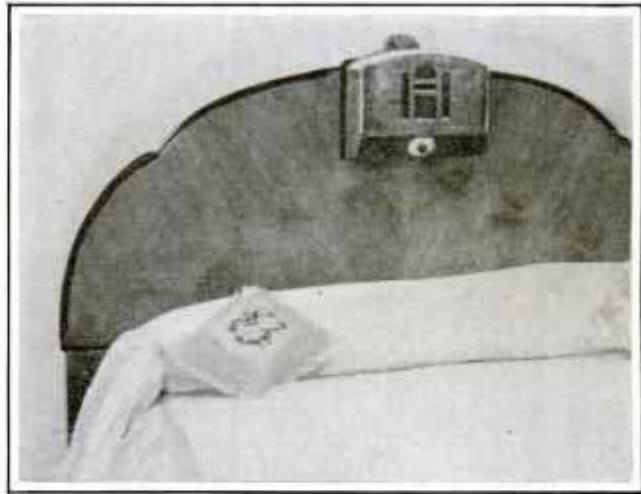


Pneumatic Speaker Showing Air Compressor and Other Accessories

Bed-Lamp Radio for Sick or Lazy Listeners

D4636

Although this set is intended for use in the manner shown, it may also be operated as a table receiver. In this case the suspension hooks are folded under the cabinet and form supporting legs. In-



Miniature Receiver with Built-In Reading Lamp for Bedside Use

stalled as a bed lamp, the light switch and radio controls are within easy reach.

Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; when material lists are not included in the articles, these are available without charge on receipt of postage.

Western Radio mfg.
Co 3044 11 Main St.

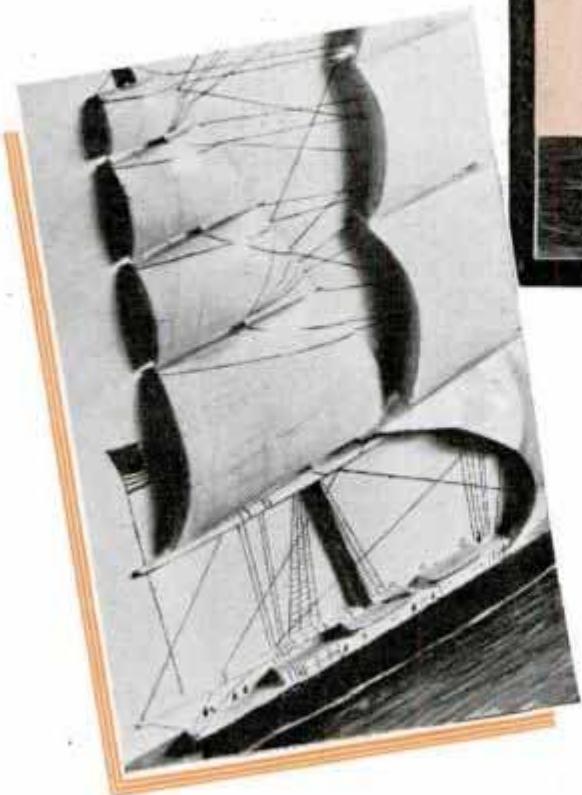
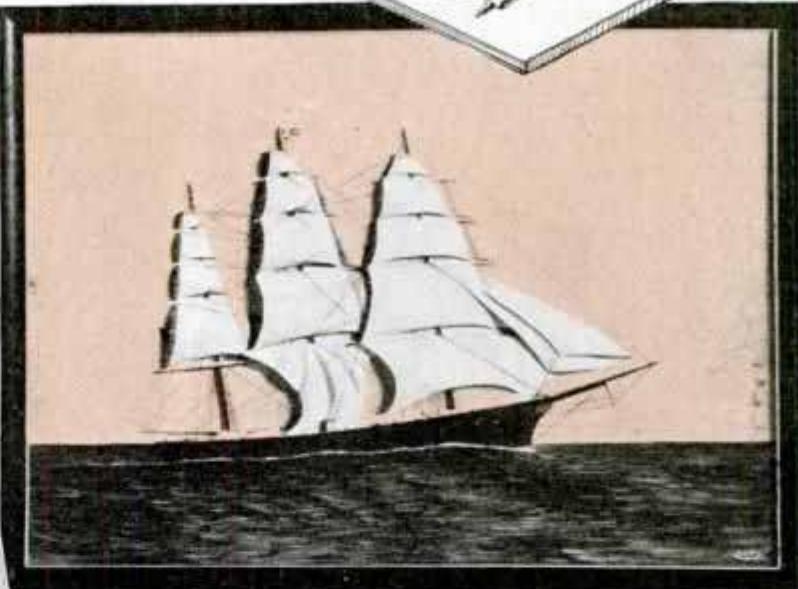
AMATEUR MECHANICS



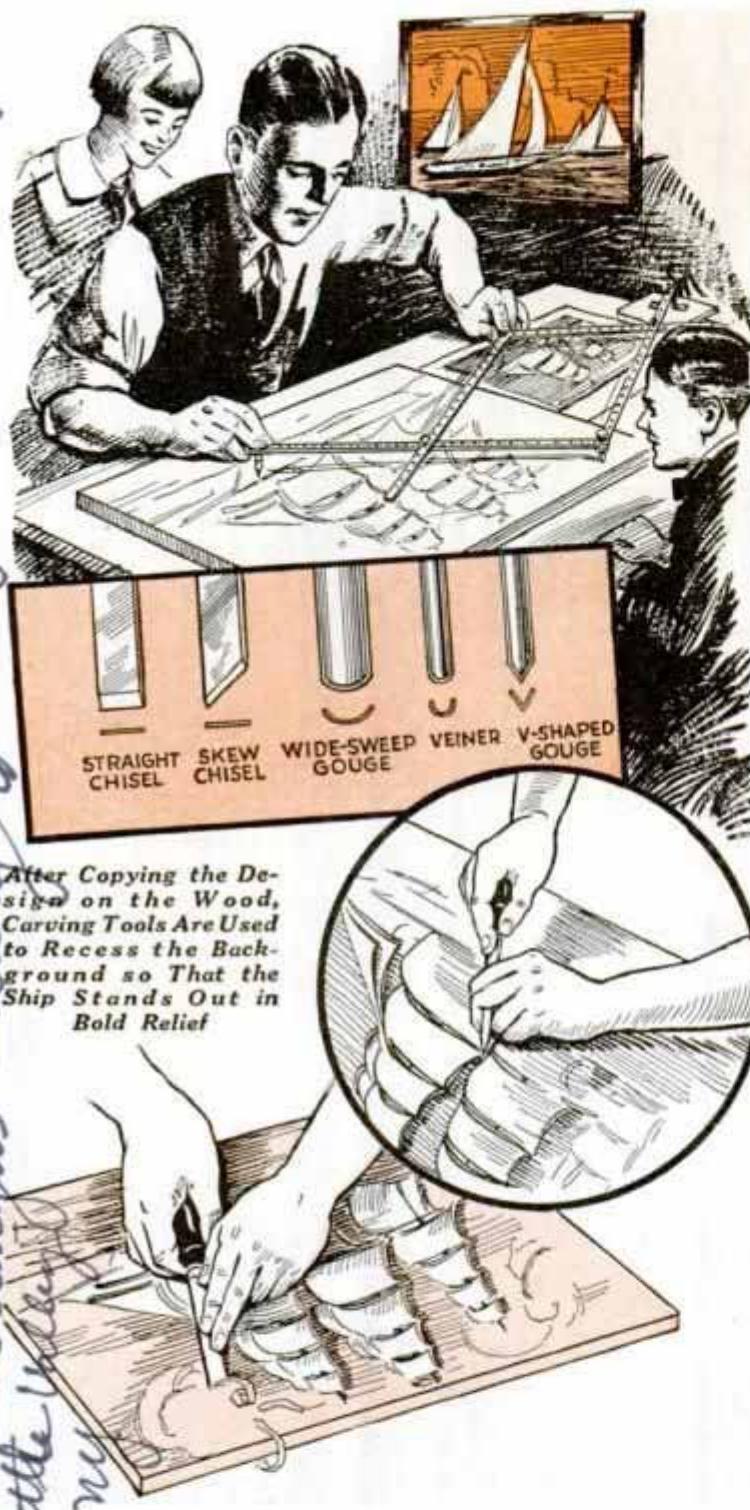
Ship Plaques in **CARVED RELIEF**

By Lloyd H. Thomas

UNUSUAL ship plaques in carved relief provide interesting work in your spare hours, and the finished pieces find ready sale as hand-carved novelties. Clipper ships such as shown in the accompanying photos, are especially suited to such reproduction as they do not involve many intricate details found in other types. The hull stands out from the background but meets it at the water line, and the bellied sails add to the



realistic appearance. The most popular size is about 18 by 24 in., and as stock lumber of such width is hard to get, it will be necessary to dowel and glue two pieces of stock together. Soft, white pine, 1 in. thick, and free from knots or blemishes, is recommended. To begin, a margin is drawn about 1 in. from the sides. The picture of the ship you wish to copy may be of any size as it can be transferred to the surface of the plaque by means of a pantograph, or, if it is already of suitable size, it may be traced with carbon paper. Be



After Copying the Design on the Wood, Carving Tools Are Used to Recess the Background so That the Ship Stands Out in Bold Relief

sure that the entire design is marked clearly on the wood. Then, with the use of a few carving tools, which may be purchased in sets, carefully cut the wood of the background away so that it will be $\frac{1}{2}$ in. below the rear edge of the sails and top part of the hull, but gradually gets flush with the surface of the wood at the margins. It is best to begin by making the vertical cuts at the outline and then to remove the waste by working toward this cut with a wide-sweep gouge or straight-edge chisel. The sails should taper from

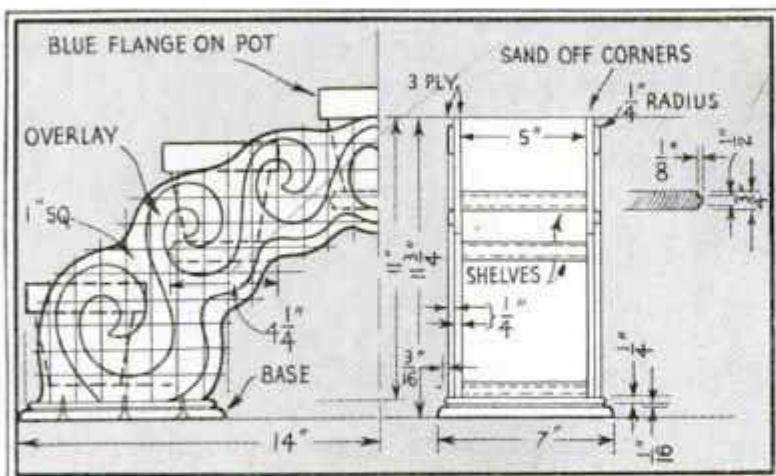
$\frac{1}{2}$ -in. thickness at the rear edge to come nearly flush with the background at the front edge. They are then given a bellied effect by cutting down at the top and bottom to form a gradual curve. Shaping of the hull to get graceful lines will require some care and patience. At the water line, the hull should come flush with the recessed background as well as at the bow, while the stern generally has a more pronounced angle. Deck fittings such as cabins, life boats, etc., may be carved out as part of the hull, or they may be made separately and glued in place on the deck. Masts and spars may be carved for best effect, but they may be painted on the background if desired.

When you have finished the work of carving, use a steel scraper to smooth the background, sails and parts of the hull, and then finish the entire surface with fine sandpaper. The water background, however, may be roughened to give the effect of waves. The plaque is then ready for painting. First apply a couple of coats of shellac, sanding with fine sandpaper between each coat. The background should be painted with flat white in which colors are mixed to get the various shades desired. The boat may be done with enamel so that its luster will be in sharp contrast to the flat background. It has been found best practice to start painting with the masts and sails, at the top, and then working toward the hull.

After painting has been completed the rigging is done. For this you can use India ink applied with a drawing pen, or you may use black enamel so that these details will correspond to other glossy parts of the ship. The plaque is finally set in a suitable frame, after sawing the edges of the plaque off close to the margin lines so that it will fit the frame properly.

Light scratches on mahogany furniture are made less noticeable by iodine applied with cotton wrapped around a toothpick.

Japanese Bridge to Hold Your Flower Pots



Suggesting a Japanese bridge, this flower-pot stand is just as effective on the floor in the sun room or porch, as it is on a table or chest. Prepare a half pattern by ruling a strip of wrapping paper in 1-in. squares and penciling in the design. Transfer this with carbon paper to $\frac{1}{4}$ -in. plywood. The overlays may be laid out in halves, an especially convenient arrangement for power work, as the four blanks can be stacked together, with nails driven in the waste wood for band-sawing with a $\frac{1}{8}$ -in. blade. Likewise, for machine cutting, the two sides can be shaped at once. The shelves may be molded or left plain. To simplify dust-



ing, the corners of the overlays should be rounded to $\frac{1}{4}$ -in. radius, a matter of a few minutes' work if a spindle shaper is at hand. The bases should be large enough to project beyond the overlays at the sides. Assemble by gluing and nailing, filling the nail holes with plastic wood. Then glue and brad the overlays in place.

Stipple Painting Improves Appearance of Worn Linoleum

Linoleum on which the figure or design has worn off can be given a new appearance by first enameling it to provide a suitable background, and over this stippling with either harmonizing or contrasting colors. It is a good idea to first experiment on a scrap piece until the desired effect is obtained. Then clean the linoleum and apply the background coat. When this dries, stipple with a piece of fine-grained sponge. Or, if you wish, unusual effects can be had by applying the sponge at random, keeping the splotches uniformly spaced, and then filling in between them with another color. Another method is to apply the background coat, and after this has dried, apply a contrasting coat. Then while the latter is still wet, pat it with a sponge to remove part of the paint so that the lower coat is exposed.



Appearance of Worn Linoleum Can Be Improved Greatly by Stippling It with Enamel



Cloth Bag Filled with Shot Holds Edges of Parchment on Lamp Shade until Glue Dries

Shot Bag Helps When Gluing Lamp Shades

Amateur lamp-shade makers who experience difficulty in getting the seam of the parchment to dry neatly will find it easy to solve this problem by placing a cloth bag filled with shot over the seam until the glue dries. The bag will be found far more satisfactory for holding the parchment than clamps or a flat weight as it is flexible and readily shapes itself to the contour of the shade.

Broken Light Bulb Removed with a Cork

Rather than attempt to remove the screw end of a broken light bulb with your fingers as you may cut them, or even with a pair of pliers, as bits of the glass may fly off and get into your eye, take an ordinary cork, press it firmly into the base and you will find that it is comparatively easy to unscrew the bulb.—L. Kasper, Philadelphia, Pa.



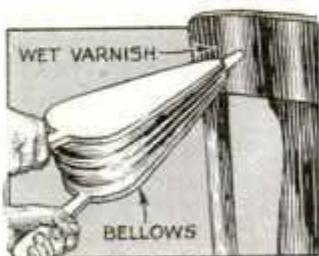
Salt, 1 oz., dropped in the trap of a kitchen sink will prevent the drain pipe from freezing at night.

Folding Stairway for the Attic

Disappearing through a trapdoor into the attic, this counterbalanced stairway requires no space in the room into which it opens. The well or opening for the trapdoor should be about 30 by 42 in., depending on the spacing of the ceiling joists, and the substantial trapdoor, which is made of $\frac{3}{4}$ -in. material, is hinged so that it drops down. The stairway is built in two sections as shown in Figs. 2 and 3, using 1 by 4-in. side members, the upper section being sixty per cent of the total length. For a 9-ft. ceiling, a stairway 10 ft. 6 in. long is recommended. Hardwood guide rails, to slide in guides screwed to the trapdoor, are screwed to the side members of the longer section as in Figs. 4 and 5. As dimensioned, there will be about $\frac{1}{16}$ in. clearance, and in addition, you can apply wax to the rail to make it slide freely. Iron hand rails can be installed as indicated. The upper and lower sections are assembled with strap hinges, as in Fig. 3, and provided with stout hooks to lock in the service position. Flat-iron X-braces should be screwed to the back of each section. Note the pulley arrangement as in Fig. 3. The counterbalance, when the ladder is open for use, does not quite pull the ladder up, but with the lower section folded, a light push will start it, and the higher it goes the greater is the leverage, so that the trapdoor with the ladder on top, automatically closes. The pull cord should be overhead but within reach so that the ladder can be pulled down as in Fig. 1.

Hand Bellows Eliminates Bubbles on Varnished Surface

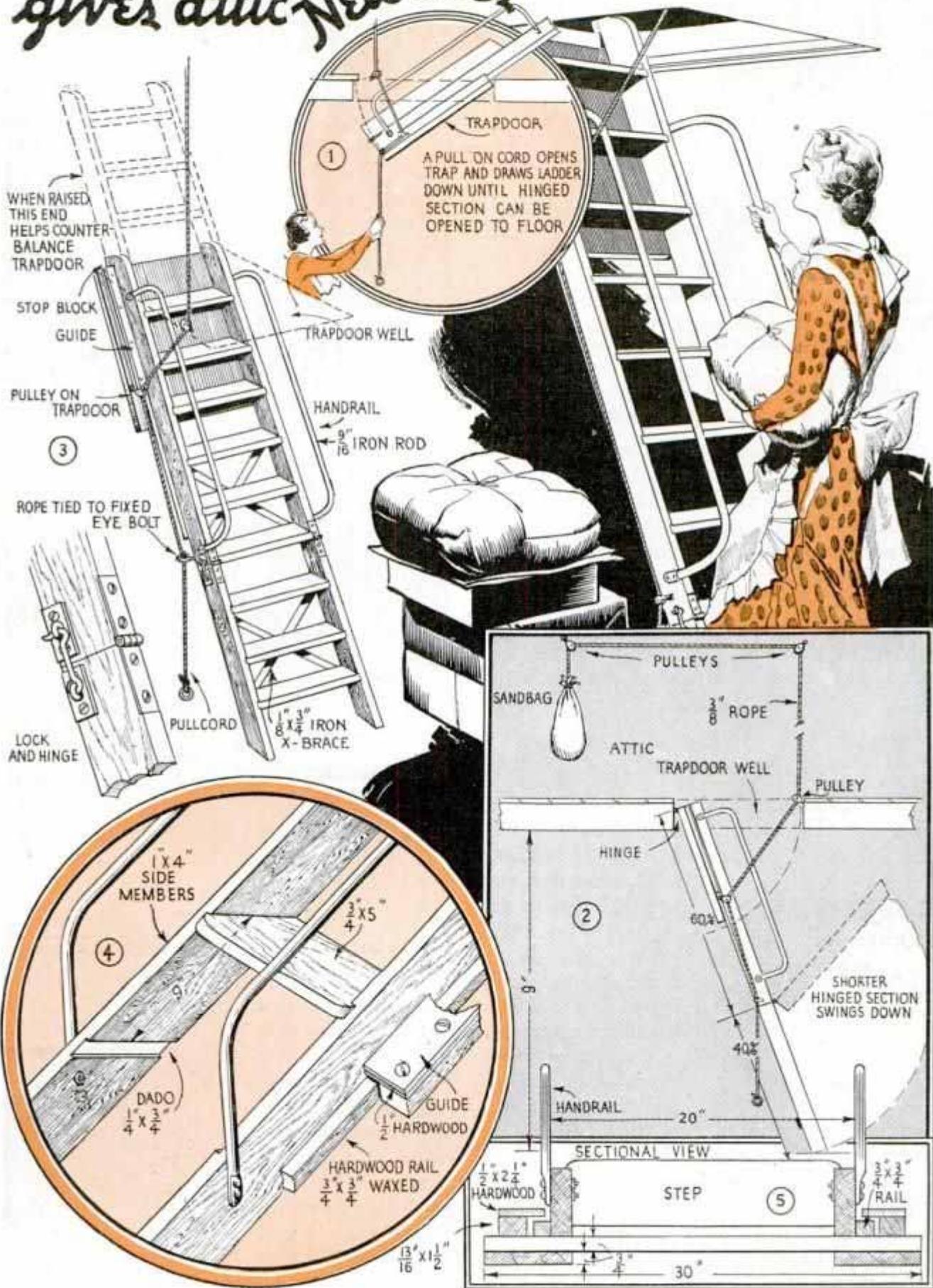
When bubbles form in varnish as it is applied, you will find they can be removed by blowing on them. This leaves a smooth finish that requires little sanding or rubbing. If the job is of fair size, the blowing can be done with a small hand bellows. Do not use the bellows too strongly if there is any danger of stirring up dust by doing so.—John E. Hyler, Peoria, Ill.



One made by Magazine boy
55t University Ave
St Paul, Minn

FOLDING STAIRCASE

gives attic new uses





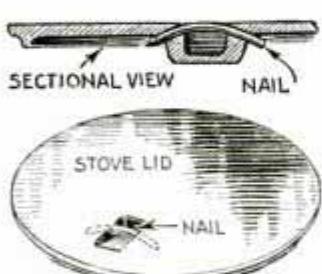
Mirror on Front of Carriage Enables Mother to See Baby without Stooping to Look under Hood

Rear-View Mirror Permits Mother to See Baby in Carriage

When wheeling your baby, have you often wished for some way to see it without stopping to look under the carriage hood? If so, an auto rear-view mirror, which can be purchased for a quarter, will solve the problem. The mirror comes with a bracket, which is screwed to the front of the carriage. It is then easy to adjust the mirror so that you can see the reflection of the baby from the rear of the carriage.

Broken Lips in Lifter Hole of Stove Lid Repaired with Nail

If the prongs or lips inside the lifter hole of a stove lid are accidentally broken off, the lid can be repaired with a headless nail.

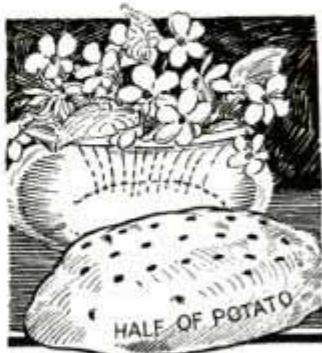


Small holes are drilled at an angle through the sides of the lifter hole, and the nail, from which the head is removed, is driven through them as indicated, providing an anchor for the toe of the lifter.—Carl H. Stegeman, Rochester, Ind.

Small pieces of soap can be utilized by putting them in a cloth bag, which is then placed in the wash boiler while heating wash water.

Potato "Frog" Preserves Freshness of Cut Flowers

If you want your cut flowers to stay fresh longer than they ordinarily do, use one half of a potato as a frog. The top of the potato is perforated with a sharp nail and is used in the same manner as are frogs of glass. It is thought that the plant-digested starch of the tuber imparts additional vitality to the flowers as they take up the moisture. The frog is, of course, covered with water in the dish or bowl after the flowers have been arranged.—G. E. Hendrickson, Argyle, Wis.



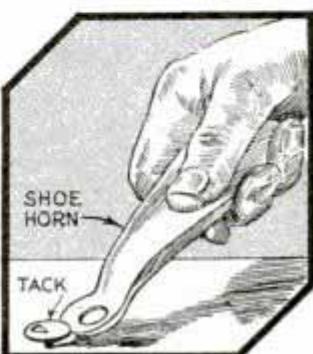
Pie Divided Evenly by Crimps in Rim of Pan



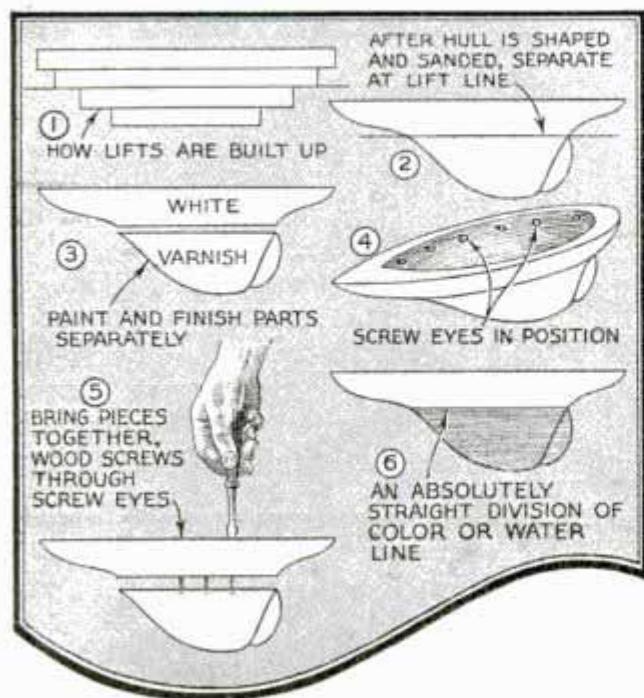
To aid in dividing pies into equal portions, take a pair of pliers and crimp the metal at measured points around the rims of the pans. Then, when the top crust is spread over the pie and trimmed, a slight pressure with the thumb or a knife over each crimp will leave the division marks clearly defined in the crust.

Shoehorn Used as Thumb-Tack Puller

For pulling thumb tacks or poster tacks, a shoehorn is an effective little tool, as the ball of the handle part provides the leverage for prying out the tack. If necessary, the edge of the ball part may be beveled slightly with a file so that it will slip under the tack head more readily.



Getting Straight Waterlines on Ship Models



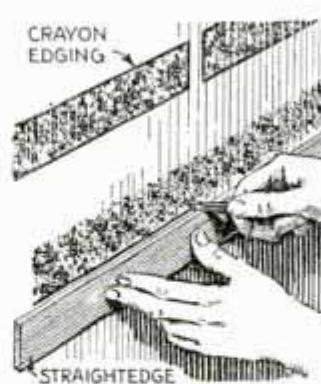
As there isn't a straight line or square surface to be found on model-ship hulls, the job of putting on a straight waterline is often a perplexing problem. There is one method, however, through which, if only reasonable care is used, nearly perfect results will follow. There are only two requisites; one is that the hull be made up of lifts in the "bread-and-butter" fashion as in Fig. 1, and the second is that the portion from the waterline up to the deck be hollowed out, which is often done in making exhibition models. When assembling the hull by gluing lifts together, note which lift is at the waterline, Fig. 2. Put only sufficient glue on it to hold temporarily. Then, after the hull is properly shaped and sanded down sufficiently to be ready for application of finish, separate the hull at the lift where the waterline is to be. The model on which this scheme was employed required a white freeboard and varnished under-water part as in Fig. 3. Both parts were finished and then permanently reassembled. Naturally, with a high finish to protect, clamp pressure on the hull would mar the finish. By placing small screw eyes, equally spaced around the inside of the upper portion, Fig. 4, and then driving wood screws through the screw eyes, into the lower portion of the hull as in Fig. 5, both parts of the hull can be held together firmly. The screw eyes



can be allowed to remain in the hull because the deck will hide them from sight, or they can be taken out after the glue has dried. Slight additional rubbing and polishing will erase excess glue.—Kenneth Cloud, Chicago.

Edging Stripes on Furniture with Wax Crayons

After stippling stripes about $\frac{1}{2}$ in. wide on some painted furniture, using a fine-grained sponge to stipple red and green paint over an ivory background, I found that the paint had worked under the edges of the stencil and made the stripes uneven.



While experimenting to overcome this trouble, I lined the edges of the stripes with a wax crayon, using a straightedge to get the lines even, and found that neat effects could be produced by using crayons

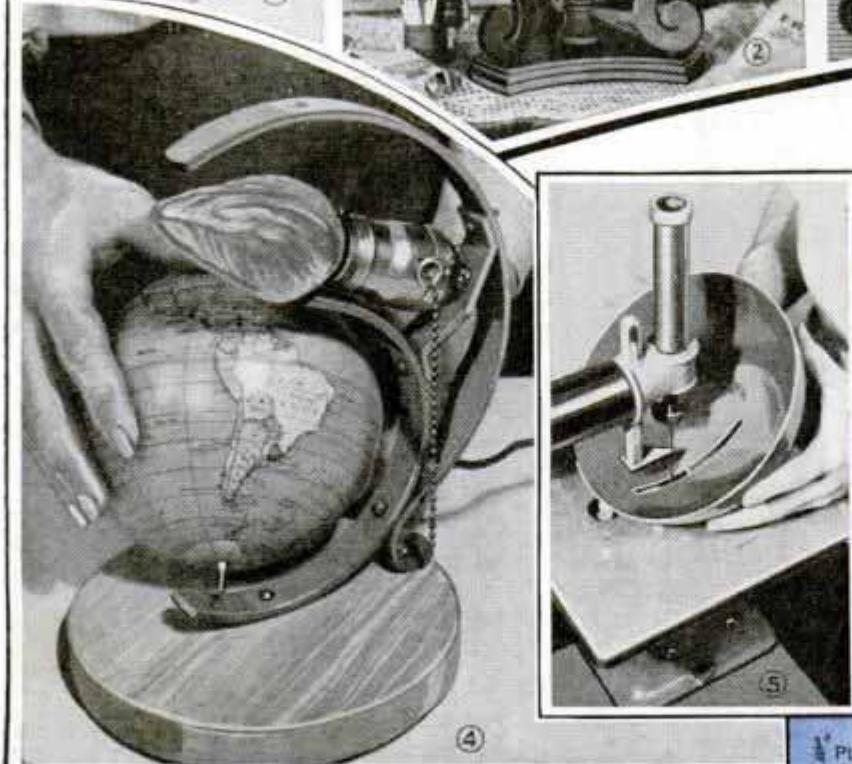
that harmonized with the colors in the stripes. A coat of clear varnish prevented the crayon lines from being rubbed off.—C. O. Soots, North Salem, Ind.

When the keyhole in the end of the drill-chuck screw is worn, drill a hole in the other end of the screw and broach or cut it out square to fit the key.

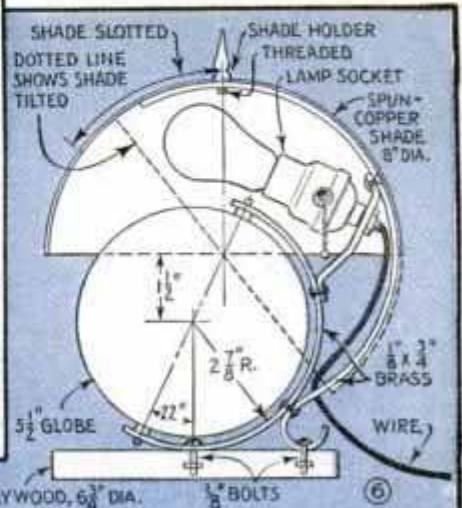


Attractive MOUNTINGS

ANY inexpensive world globe can be made more useful and ornamental by mounting it. Three simple suggestions are shown in Figs. 1, 2 and 3. The first one, also detailed in Figs. 4, 5 and 6, has a tilting shade. It consists of a wood base and two strips of $\frac{1}{8}$ by $\frac{3}{4}$ -in. brass, bent to a circular shape. The smaller circle forms the mount proper for a $5\frac{1}{2}$ -in. globe,

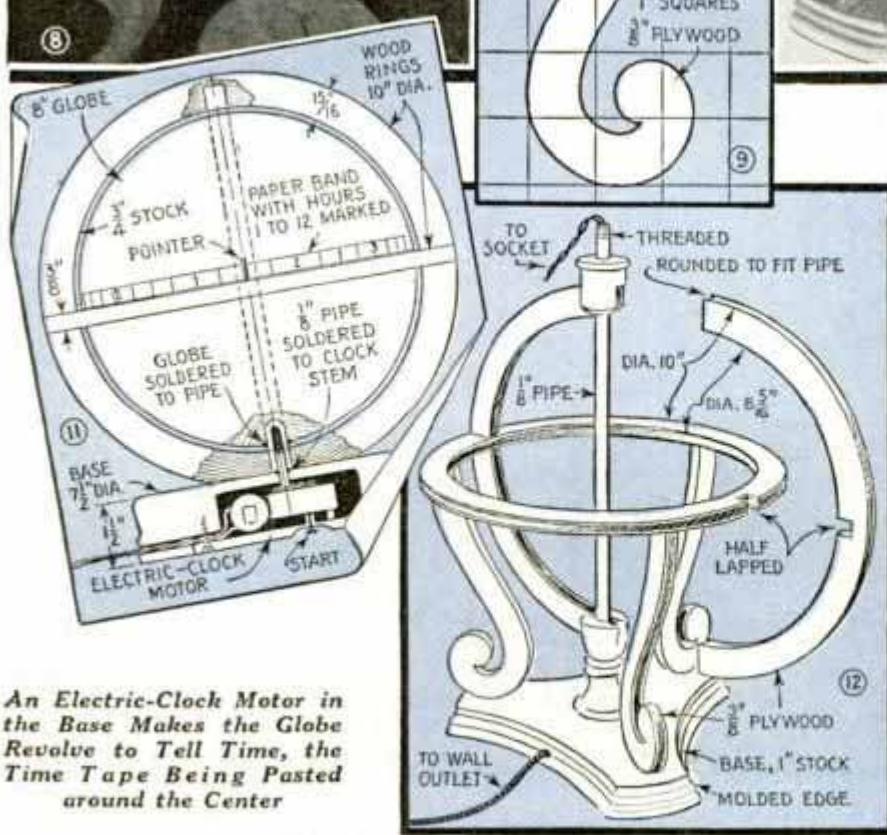
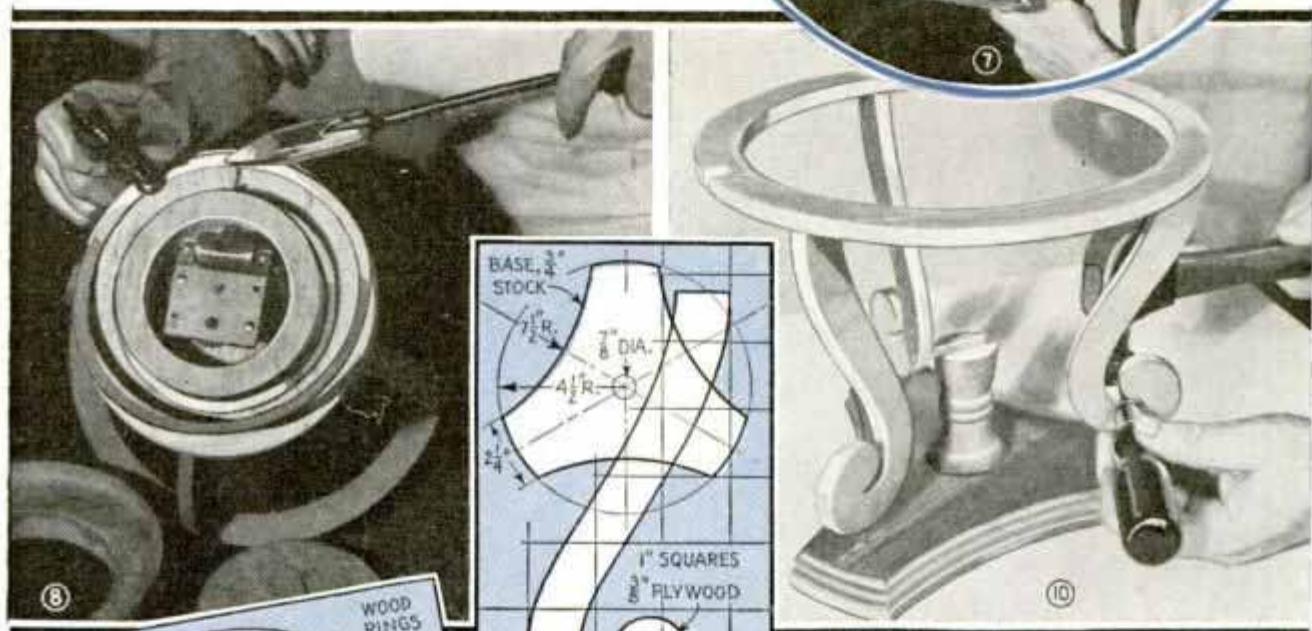
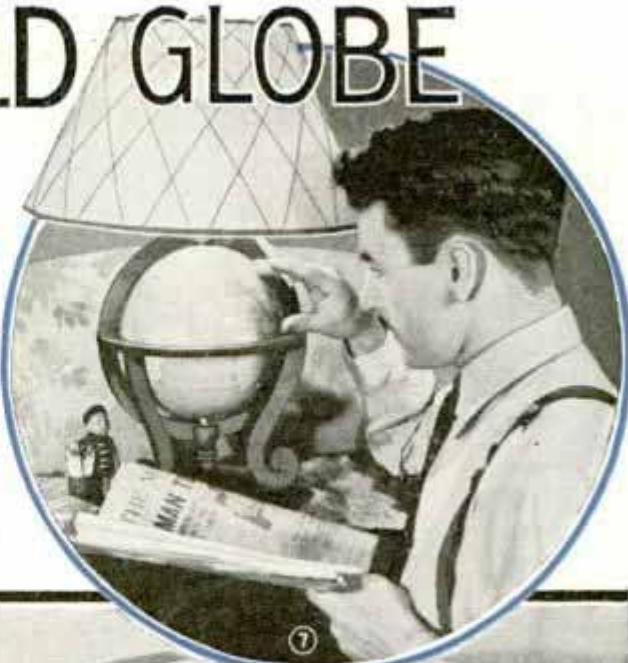


These Three World-Globe Mountings Show What Can Be Done to Make Inexpensive Globes Both Attractive and Useful



for your WORLD GLOBE

while the larger one holds the shade, which is spun from 16-oz. copper, on the lathe. The one shown in the photographs was spun from a 10 $\frac{3}{4}$ -in. disk. Adjustment is obtained by slotting the shade, as in Fig. 6, and using an ornamental brass thumbscrew, which fits a tapped hole in the shade holder. Figs. 2 and 7 picture an attractive mounting for an 8-in. globe. The construction is all wood with the exception of the length of $\frac{1}{8}$ -in. pipe, which forms

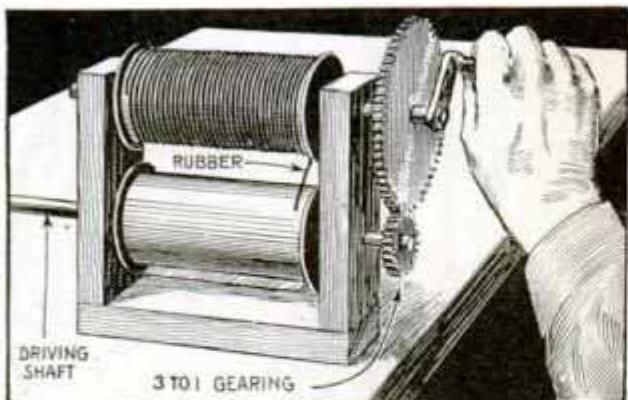


An Electric-Clock Motor in the Base Makes the Globe Revolve to Tell Time, the Time Tape Being Pasted around the Center

the axis for the globe and the support for the light socket. Figs. 9, 10 and 12 show the dimensions and method of assembling.

By adding an electric-clock motor to the base of any globe mounting, you can make the world revolve, and thus, with a simple paper scale, pasted to the globe, make the unit tell time. See Figs. 3 and 11. This globe cannot be spun but the stand must be turned. However, if you want the globe to turn, fit the base with copper slip rings as in Fig. 8.

**Powerful Rubber-Band Motor
That Is Different**



This Rubber-Propelled Motor Has a More Constant Driving Torque Than the Usual Type

Suitable for driving model boats, toy cars, etc., this rubber-band motor has an

advantage over the usual type in that more energy can be stored and the driving torque remains almost constant throughout the unwinding cycle. The parts needed are two small drums, two shafts and a couple of gears having about a three-to-one ratio. A crank may be soldered to the upper shaft, or the end of the shaft bent to form a crank. When assembling the motor, wind a long rubber band loosely on the upper drum and attach the end to the lower one. As the lower drum turns three times as fast as the upper one, the rubber is stretched three times its length when the motor is wound up.—Ralph E. Green, San Diego, Calif.

Milk will sour quickly if a few drops of vinegar are added to it.

Build Your Auto Trailer Early



Outdoor Kitchen on the Trailer Provides Shelter while Cooking Outside

This touring trailer has two full-size beds, running water, electric lights and a radio, besides a kitchen, pantry, wardrobe and several storage compartments. Its small size (8 ft. long and 5½ ft. wide) and light weight (750 lbs.) make it easy and economical to haul around with light cars. Hard pressed board is used over a sturdy framework mounted on an auto chassis. A set of three Popular Mechanics blueprints (Nos. SN 815, 816 and 817) covering its construction, will be sent to anyone upon receipt of 75 cents.

400 Popular Mechanics Blueprints

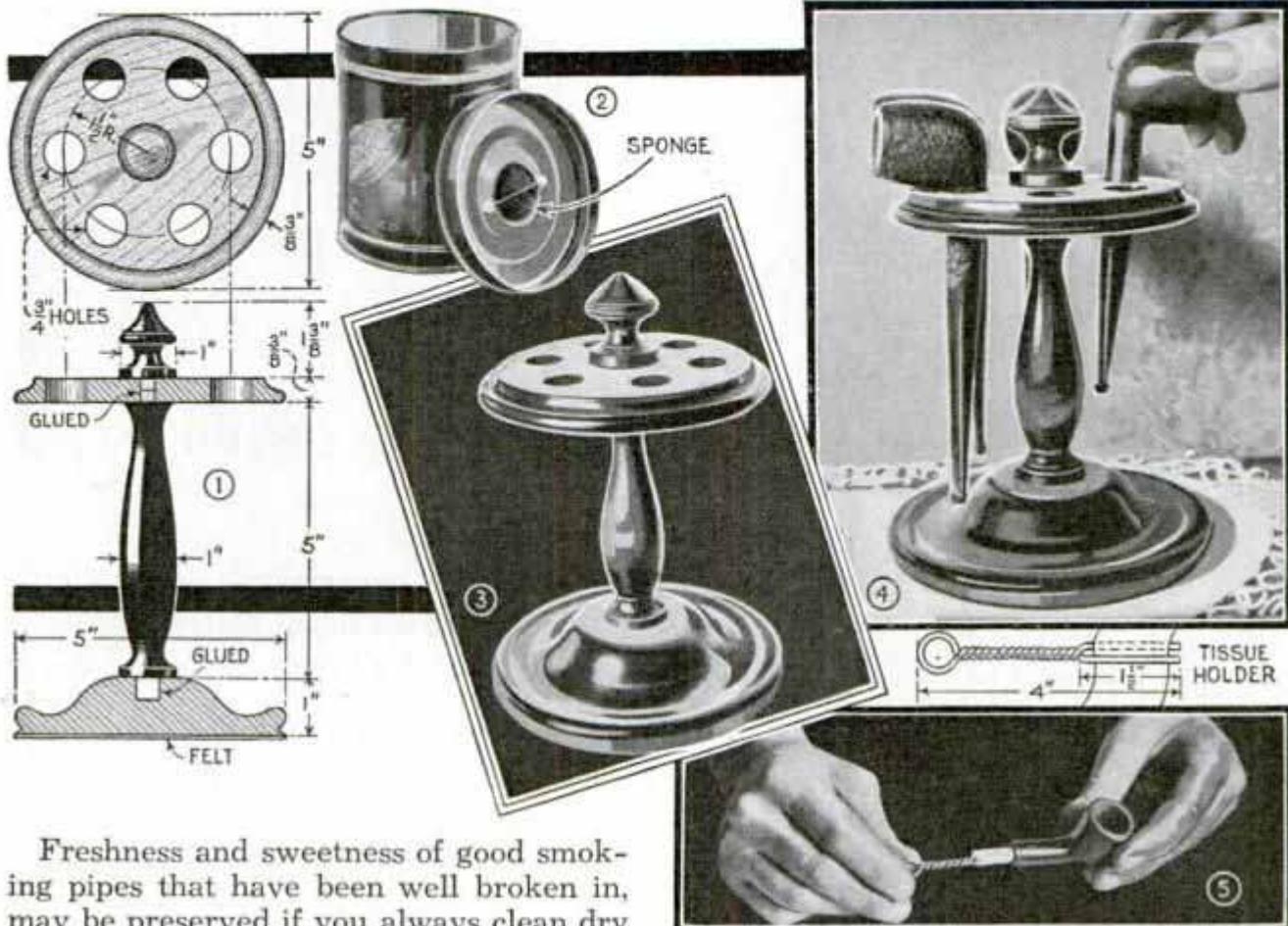
offer you plenty of variety in your hobby or spare-time business. This service includes plans for making boats, furniture, radio apparatus, toys and novelties, home-workshop machines and all kinds of models, besides many other miscellaneous subjects. A complete, free list of these prints will be sent to anyone for 3c to cover mailing costs.

Blueprints are 25 cents each or six for \$1.00. Address Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario Street, Chicago.



Double-Deck Tea Cart with Turned Legs—25c. Order No. SN 666

More Enjoyment from Your Favorite Pipes

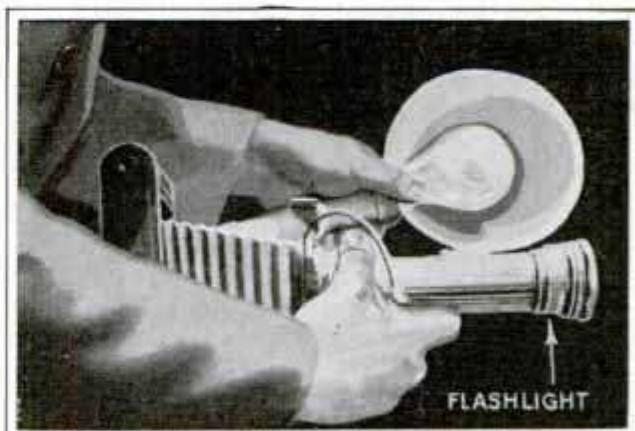


Freshness and sweetness of good smoking pipes that have been well broken in, may be preserved if you always clean dry the inside of the stem and bowl carefully before setting them away. To make a handy stem cleaner, a piece of wire is bent to form a loop, is twisted together at the center, and has two free ends to hold a piece of tissue paper. After removing the stem, it is twisted inside the pipe as shown in Fig. 5, and will absorb the moisture. Only a clean pipe should be placed on a

rack, especially if the pipe hangs with its stem down. A neat rack, which will hold six pipes, is pictured in Figs. 1, 3 and 4, the parts being turned on a lathe and glued together. To keep tobacco fresh in 1-lb. cans, a small moistened sponge may be held on the lid with a short length of wire, soldered on, as shown in Fig. 2.

Flashlight Aids in Photographing Objects in a Dark Room

When photographing an object in a dark or dimly lighted room with the aid of photoflash bulbs, a flashlight will help you in getting the image of the object properly centered on the film. Use a focusing-type flashlight for this purpose and hold its flat end squarely against the camera lens so that the spot of light will locate the approximate center of the camera range. While holding the flashlight firmly in this position, the camera is moved until you spot the center of the scene to be photographed. Also, by holding the flashlight just above the camera and directing its light on the edges of the scene, you can



follow this in your view finder and determine how much of the scene will be taken.



Grooves Cut with Plane in Which Wood Chisel Is Substituted for Plane Iron

Chisel and Plane Combined to make Grooving Tool

When building shelves where grooves to receive shelf ends must be cut by hand in the end supports, considerable time and effort can be saved by cutting the grooves with a plane in which a $\frac{1}{4}$ -in. chisel has been substituted for the plane iron. To do this, first make two saw cuts for each groove, spacing them a distance equal to the thickness of the shelf. Then, with short strokes of the plane, remove the material between the saw cuts, starting in the center of the support and working toward the edges. Also, do not try to remove all the wood in one or two strokes.

Tool for Opening Boxes Sealed with Gummmed Paper Tape



An old toothbrush handle with one end filed or ground to a slightly curved point will be found handy for opening boxes that are sealed with gummed paper tape or rolled packages that are wrapped with paper. Merely insert the point of the tool under the paper and push it along. This will open the package without damaging the contents.

Pot-Lid Repair Knobs Improved with Small Wood Disks

To prevent the concave washers on pot-lid repair knobs from flattening so that the knobs loosen, one woman recommends using small, convex wood disks inside the washers as shown in the photo. These can be cut from a hardwood dowel of the proper diameter, and then shaped with a jackknife, after which they are drilled to take the stove bolt in the small repair knob.



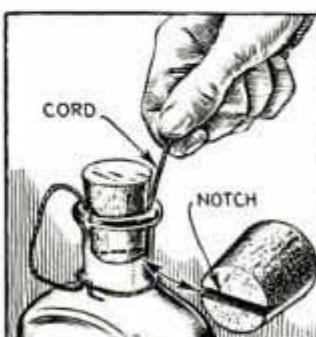
Curled Celluloid Flattened over Electric Plate

To flatten a piece of celluloid that is curled, warm it by holding it over an electric hot plate, after which it can be straightened out easily. Do not attempt to heat celluloid over a flame as it is very inflammable and may catch fire and cause a serious burn. Also, do not try to straighten it cold as it will crack and ruin the piece.



String Removes Cork Quickly

Bottles from which the corks must be removed frequently will be more handy if a string is tied around the neck of each one, and then pushed into the mouth of the bottle with the cork, leaving the free end hanging outside. In this way, a pull on the string will remove the cork, which should be notched across the small end to receive the string as shown.

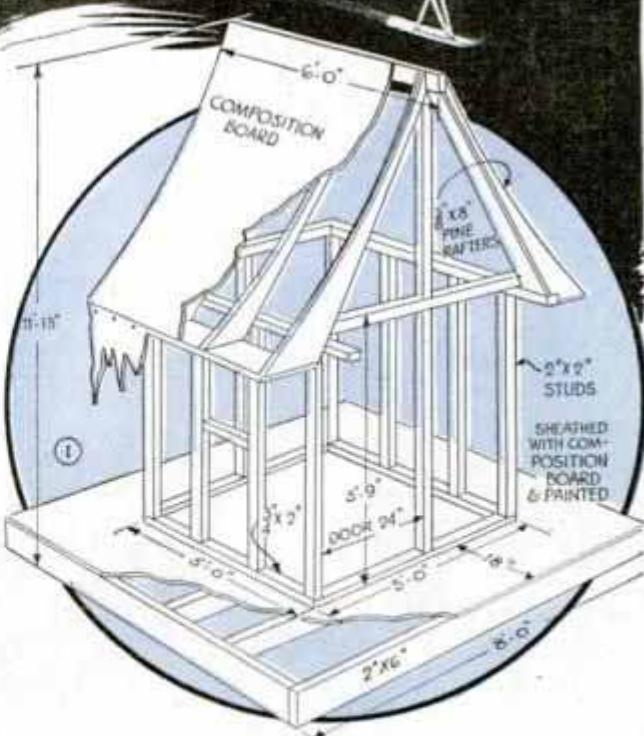


Tip: Potatoes will bake mealy if the ends are cut off before they are put in the oven.

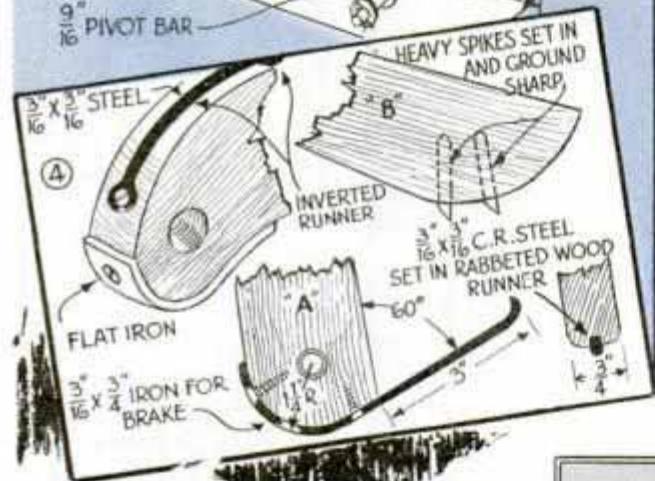
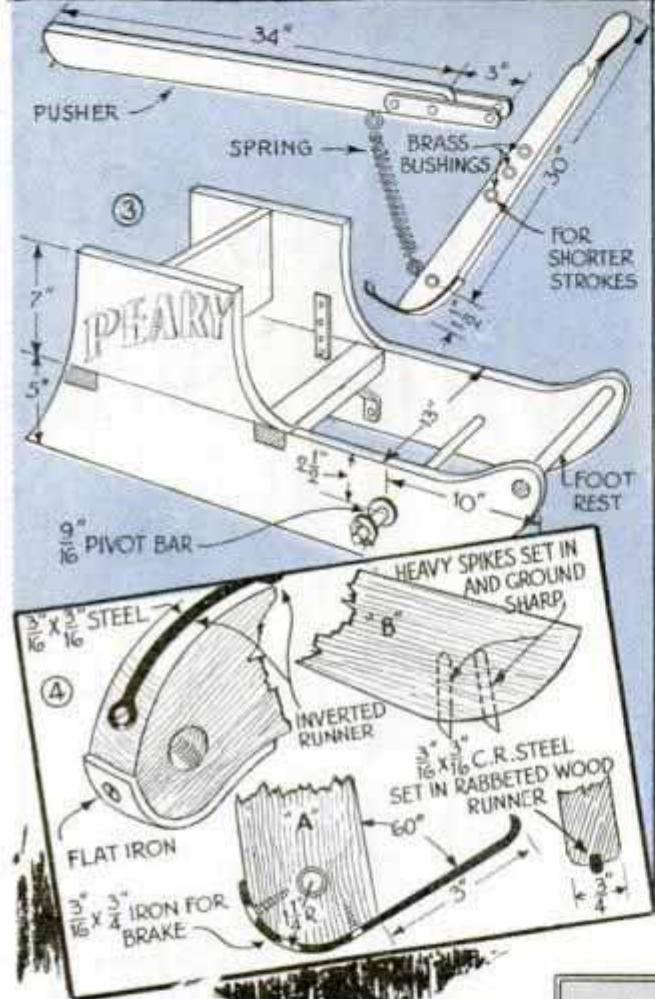
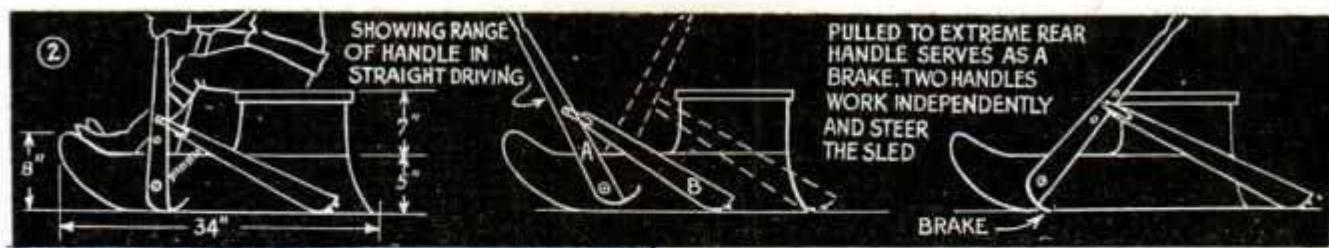


ON a popular skating pond, the rental of outdoor-sport equipment such as the Snowbird Sails, Arctic Tenpins and other items described in this article, will bring a neat profit to the enterprising builder. As headquarters, the novel house shown in Fig. 1 is suggested. It is covered with an inexpensive hard-pressed board which, if given two coats of paint, will weather a season or two. The silhouette icicles on the eaves are made from the same material and are painted with sign-painters' "crystalline," which is used in decorating windows, particularly around holiday time. With a stove, a small table and a chair, the proprietor can keep himself entirely comfortable, especially if the floor is covered with insulating board or old newspapers and a rug. The outside can be made attractive by building a fenced enclosure for the renting equipment, and setting out evergreens—a good use for discarded Christmas trees.

Figs. 2, 3 and 4 illustrate a small, self-propelled sled which will be popular with children. The handles are independent;

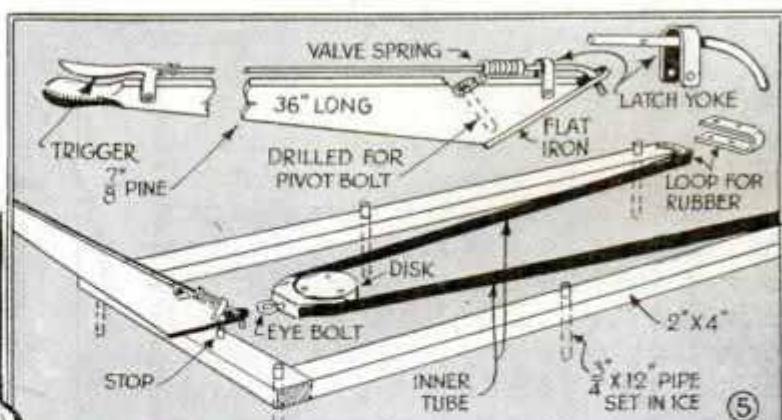


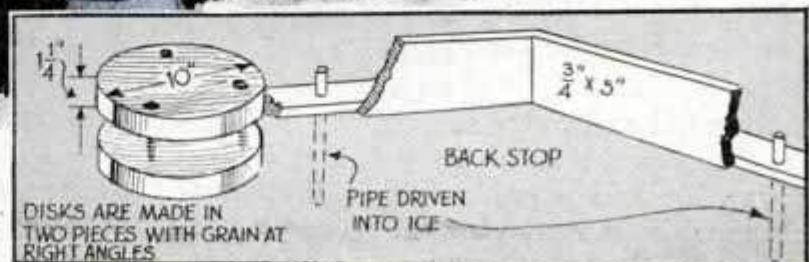
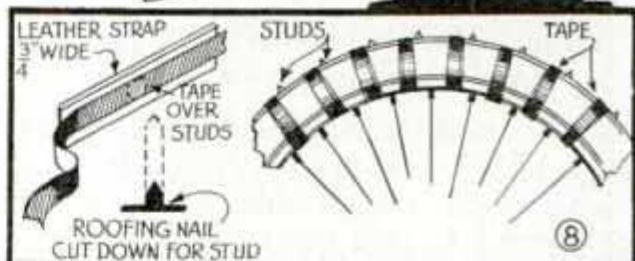
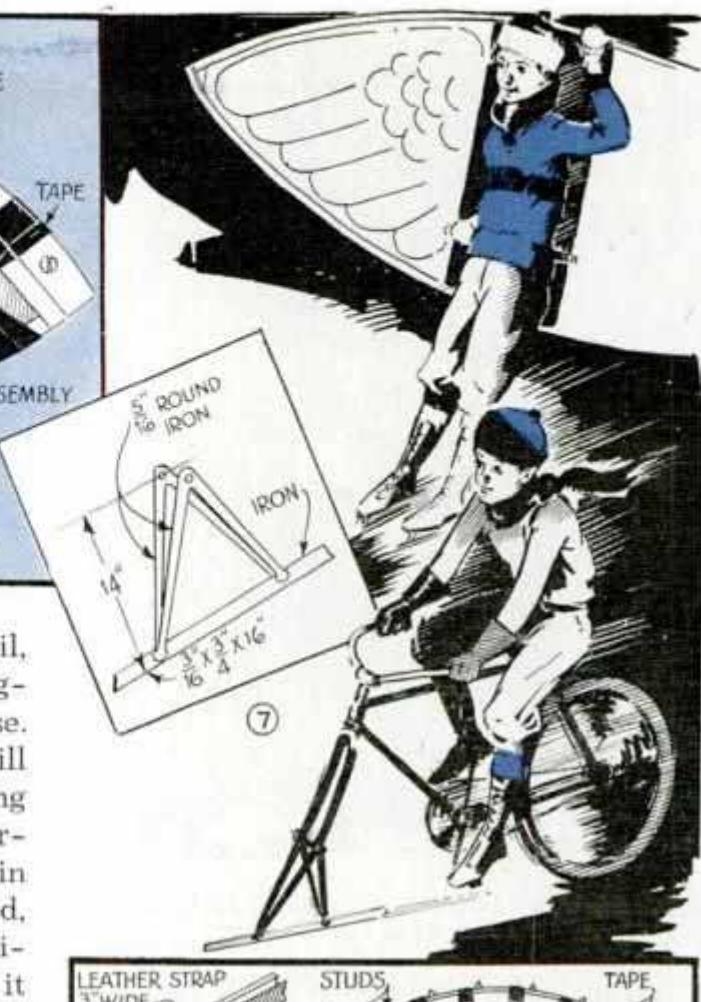
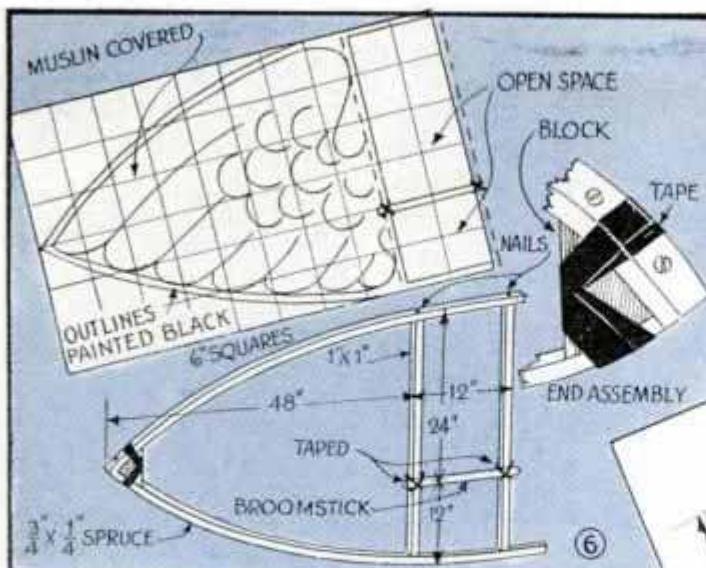
the driver can pull both at the same time or alternately. The normal span drives the sled ahead, but brakes are applied by



pulling the handles to the extreme rear, as illustrated. If only one handle is pulled far back, the sled will turn in that direction, and with a little practice one can maneuver quickly. Note that $\frac{3}{4}$ -in. pine is used throughout with the exception of the handles and pushers. Two additional holes in the handle permit adjustment for shorter strokes suitable for small children. The runners are shod with $\frac{3}{16}$ by $\frac{3}{16}$ -in. cold-rolled steel, which can be sharpened just as an ordinary skate. They present negligible resistance on the ice.

Arctic Tenpins is a giant bowling game. Instead of balls, heavy disks are shot across the smooth ice by means of a shooter detailed in Fig. 5. The fascination of this game lies in the distance to be covered—30 yards—and the ability to shift the aim by means of the pivoted handle. Another sport—bicycling—has been so popular in the summer there is no reason it should not be continued on through the winter. Details of inexpensive equipment to fit a standard bicycle for ice use are





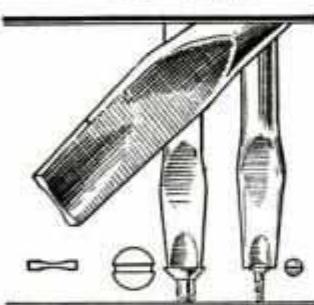


This Rigid Stool Can Be Adjusted Quickly to Suit the Height of the Worker

Adjustable Workbench Stool Made from Auto-Steering Column

An old auto steering wheel and column, and a bicycle seat are assembled to make this workbench stool, which can be raised or lowered to suit the user. The wheel serves as the base of the stool, while the vertical column is drilled and tapped near the upper end for a set screw, which holds the shaft of the seat.

Screwdriver with Hollow-Ground Point for Large or Small Screws



On jobs requiring the use of large and small screws, much time can be saved by grinding the point of a large screwdriver blade as shown so that it can be used for

both small and large screws. By hollow-grinding each side of the point, it will fit both wide and narrow slots in the screw heads without sacrificing the strength necessary for the large screws.

Paint Spray Gun Cleaned with Solvent and Pipe Cleaners

Instead of wasting paint solvents to clean a spray gun, dip a pipe cleaner into the solvent and force it through the nozzle. If the cleaner will not go through the opening in the nozzle, the latter can be removed and cleaned with a cloth dampened with the solvent, and the rest of the tubes of the gun cleaned with the pipe cleaner.—Kenneth Murray, Sturgis, Mich.



Cane Forms Molding for Models

Model makers will find that cane such as used in weaving trays and porch furniture, makes excellent half-round molding when split in half with a sharp knife. It does not require soaking or steaming to bend it and is easily attached to curved surfaces.—C. Batty, Lachine, P. Q., Can.



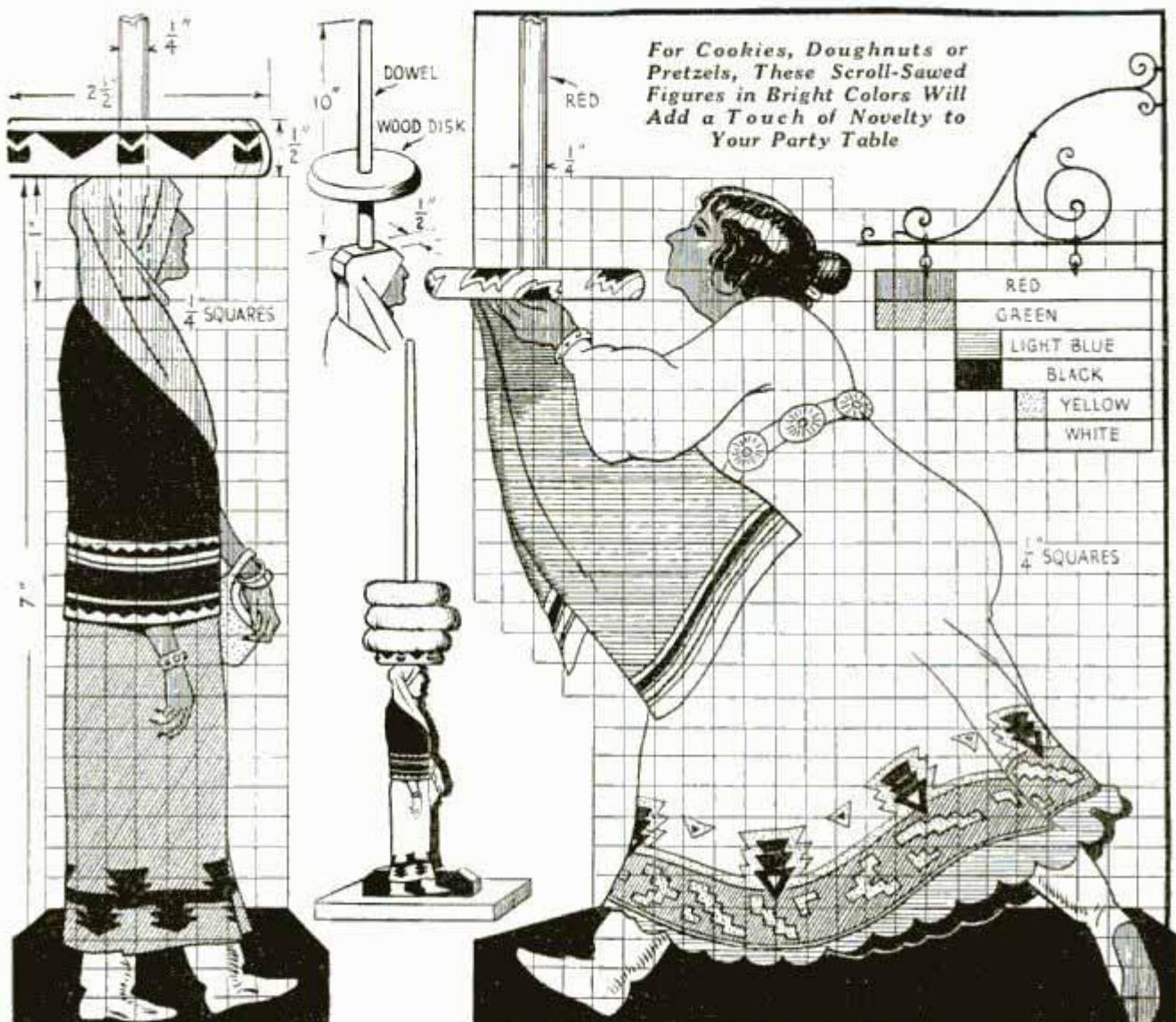
Opener for Condensed-Milk Cans

For perforating condensed-milk cans, a simple tool, which also serves as a cover, is made from a couple of pot-lid repair knobs and a strip of metal. The strip is drilled near the ends to take the knob screws, which are pointed to puncture the can. The knobs are held in place by raising the metal on the sides of the screws with a cold chisel.



Crochet cotton will be found better for darning stockings than regular darning cotton as it does not harden when washed.

Indian-Squaw Doughnut or Pretzel Holders



Resembling Indian squaws, these two holders for cookies, doughnuts or pretzels will add a touch of novelty to the table at your party. After laying out the figures on sheets of paper ruled in $\frac{1}{4}$ -in. squares, trace them on $\frac{1}{2}$ -in. plywood and cut them out with a scroll saw. In the hands of one figure and the head of the other, drill holes for $\frac{1}{4}$ by 10-in. dowels, which will extend vertically above the figure to hold the pretzels. Wood disks drilled centrally to fit on the dowels snugly, are glued in place to serve as a base on which the pretzels rest. The figures are mounted on wood bases of suitable size and weight and then painted. A suggested color chart is given in the upper right-hand corner. Tan may be used instead of white where indicated, or you may vary the color scheme as you desire.—Bob Hofsinde, Chicago.

Simulating Deck Planking on Model Ships

When professional builders construct models of modern steamships for exhibition purposes, they often achieve an effect of deck planking so accurate and close to scale that the amateur assumes such a job to be beyond his skill. However, the method is extremely simple. Instead of attempting to draw deck lines directly on the wood of the hull, the professional secures a piece of thin cardboard, dull ivory or darker in color, and cuts it to the size and shape of the deck to be finished. Using a draftsman's ruling pen and black or dark brown India ink, he draws the deck lines on the cardboard. This is then glued in place on top of the wooden hull and treated with a coat of thinned varnish. The edges of the cardboard are concealed under the railings or bulwarks.



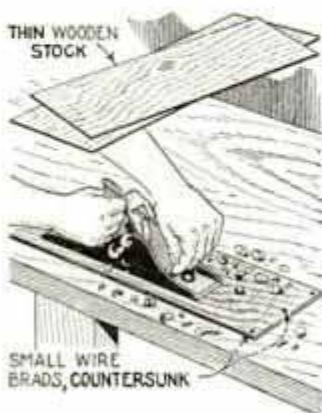
Barrel Staves Soaked in Water and Then Clamped in Vise to Dry Straight Make Good Boat Frames

Boat Frames Made from Barrel Staves

I have found that satisfactory frames or ribs for some boats can be made from white-oak barrel staves. These are soaked in water for a few hours, after which they are removed and clamped in a vise between two pieces of heavy stock. When dry, the staves will be straight. Or, if it is desired to have them slightly curved, this is done by clamping them loosely in the vise so that they will dry with the desired curvature.—Max R. Seehuber, Vancouver, B. C., Can.

Planing Thin Stock for Model Parts

To get very thin wood for small model parts, which are often made of cardboard, I use the method illustrated. Get a piece of hardwood, preferably hard maple, about 3 in. wide and saw it to $\frac{3}{16}$ or $\frac{1}{8}$ in. in thickness. Then plane and sand one side.



Fasten one end of the strip to a smooth bench top with small brads and countersink the heads. It may be necessary to first drill the wood to prevent its splitting. With a sharp plane adjusted to take a fine cut, it is a

simple matter to trim the work down to the required thickness, setting the brads into the wood as you proceed to prevent

the plane from striking them. In this way, the stock can be reduced to $\frac{1}{64}$ in. in thickness without splitting, after which strips of the desired width can be cut from it with a fine fret saw.—C. G. Grover, Nephi, Utah.

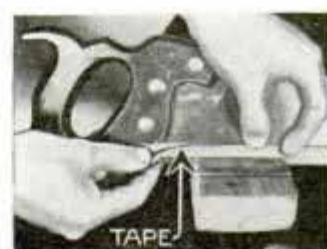
Chalk Sharpener in Eraser Handle

By cutting a V-slot in the trough on top of an eraser and gluing a strip of sandpaper into it, a sharpener for chalk crayons may be had. The end of the crayon is simply rubbed against the sandpaper at intervals to keep the point in a good condition for writing.



Gummed Paper Tape Used as Depth Gauge on Hand Saw

To easily determine the depth of a number of cross cuts to be made with a hand saw, stick a short piece of gummed paper tape to the saw blade at the required depth of the cut and saw the stock until the top surface just touches the bottom edge of the tape.—Ray J. Marran, Kansas City, Mo.



Sewing Awl from Umbrella Rib

A sturdy awl or needle for sewing sacks, canvas or burlap, may be made from the end of a discarded umbrella rib, by cutting off the ball tip and filing the end to a sharp point. The hole in the rib, which formerly was used for the attachment of the umbrella cover, serves as the eye for inserting sewing cord or thread.—G. E. Hendrickson, Argyle, Wis.



Scale Models. *the*
15 16 & Wabash
Chicago

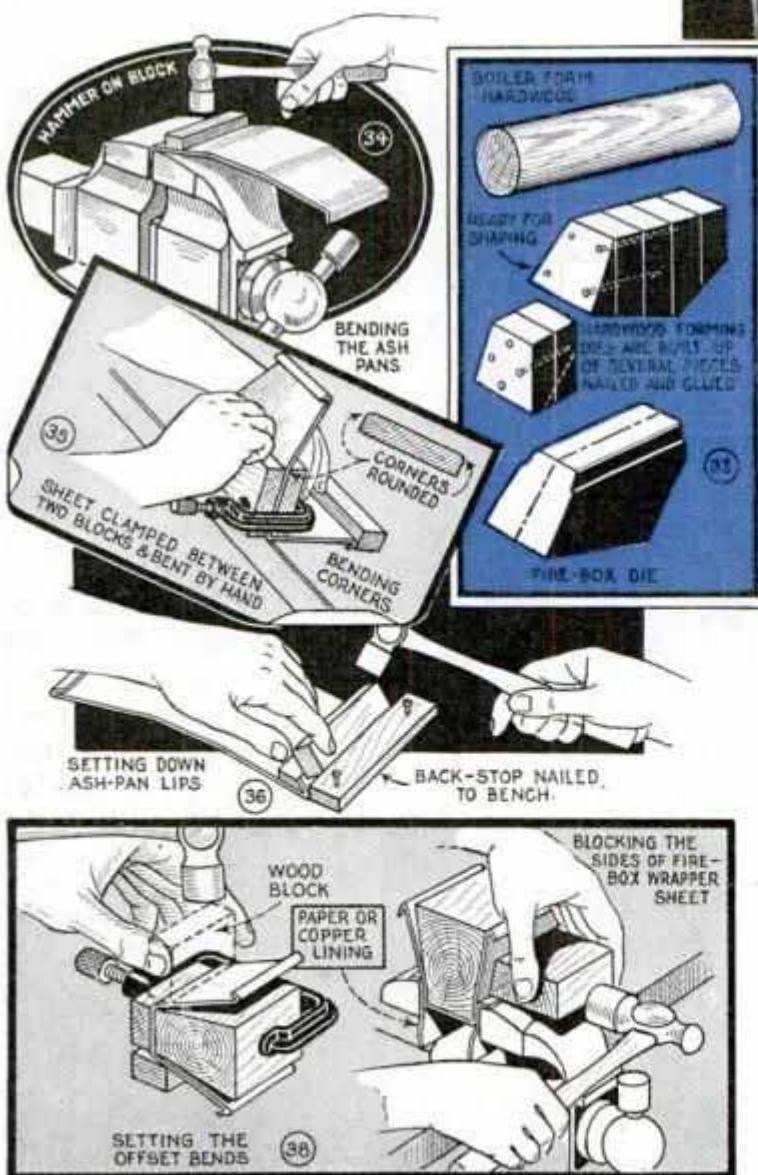
Building MODEL LOCOMOTIVES

By W. CLYDE LAMMEY

Complete kits of parts, furnished by manufacturers, make the hobby of building scale-model locomotives increasingly popular. The castings in the kits are either rough so you can finish them yourself, or are finished so you need only assemble them.

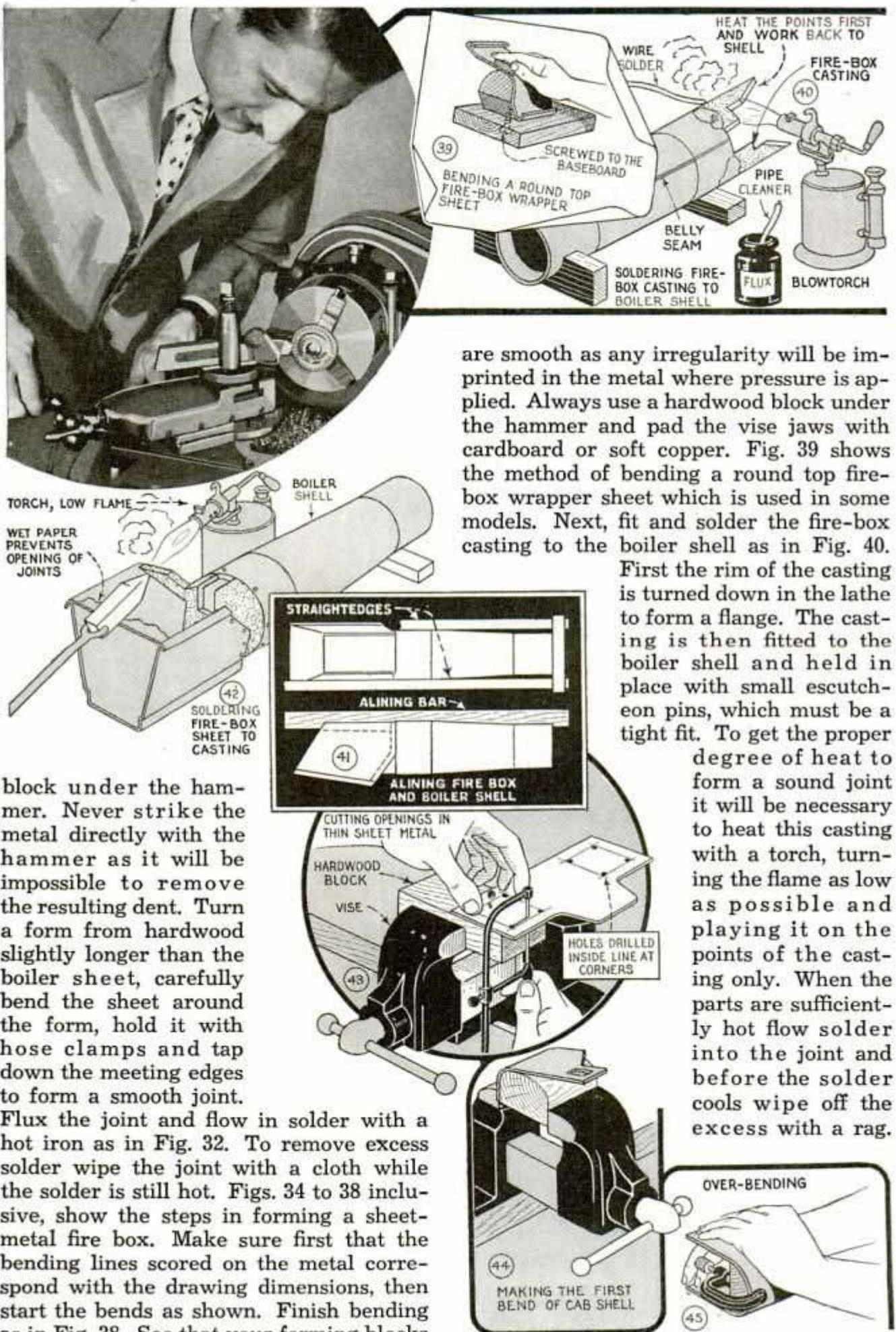
PART II—The Superstructure

TO build the locomotive superstructure you will need first a set of forming dies, accurately made from selected hardwood. The dies shown in Fig. 33 and succeeding



figures are typical of those needed for the work on any small-scale model. Drawings that come with the kit will give the size of the finished parts and the gauge and kind of metal to be used. From these dimensions it is necessary to make up the dies with proper allowances for the thickness of the metal.

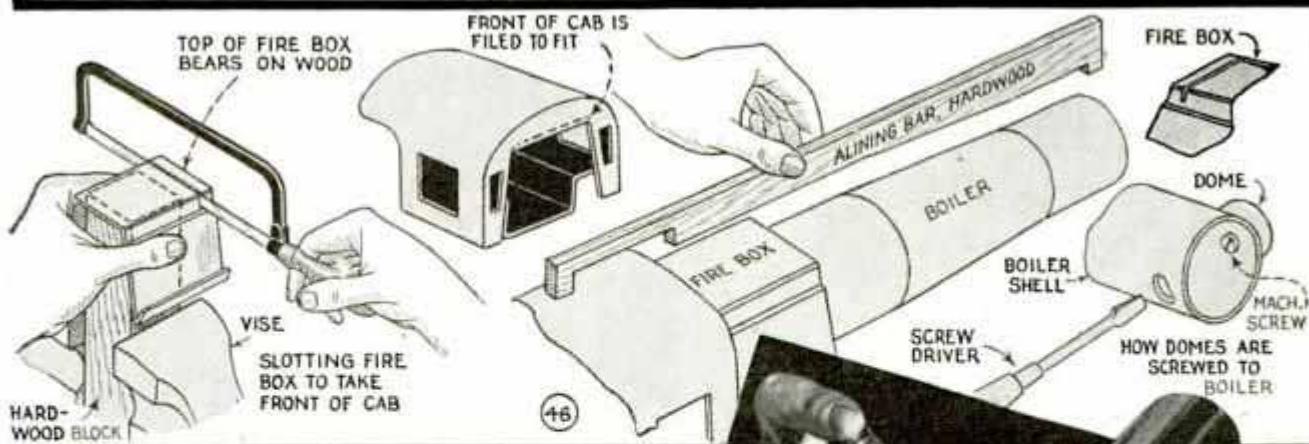
Begin with the boiler shell which is usually cut and formed from sheet brass. When you have the sheet cut to size lay it on the bench top, or any flat, smooth surface, and flatten it. Use a smooth hardwood



block under the hammer. Never strike the metal directly with the hammer as it will be impossible to remove the resulting dent. Turn a form from hardwood slightly longer than the boiler sheet, carefully bend the sheet around the form, hold it with hose clamps and tap down the meeting edges to form a smooth joint. Flux the joint and flow in solder with a hot iron as in Fig. 32. To remove excess solder wipe the joint with a cloth while the solder is still hot. Figs. 34 to 38 inclusive, show the steps in forming a sheet-metal fire box. Make sure first that the bending lines scored on the metal correspond with the drawing dimensions, then start the bends as shown. Finish bending as in Fig. 38. See that your forming blocks

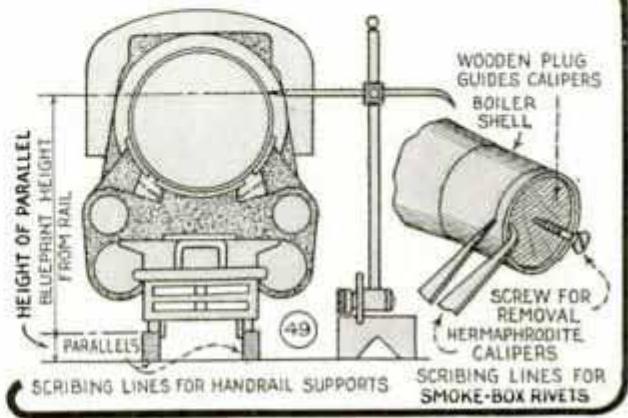
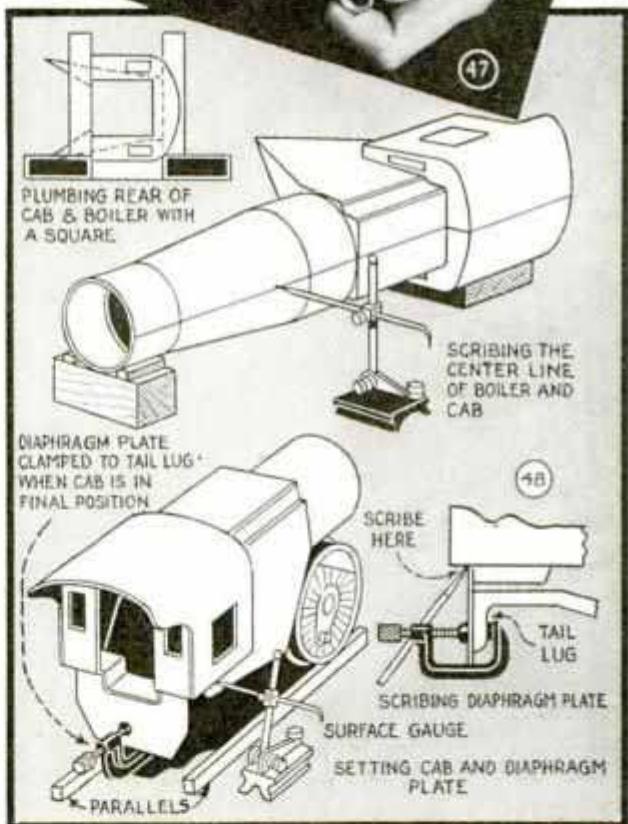
are smooth as any irregularity will be imprinted in the metal where pressure is applied. Always use a hardwood block under the hammer and pad the vise jaws with cardboard or soft copper. Fig. 39 shows the method of bending a round top fire-box wrapper sheet which is used in some models. Next, fit and solder the fire-box casting to the boiler shell as in Fig. 40.

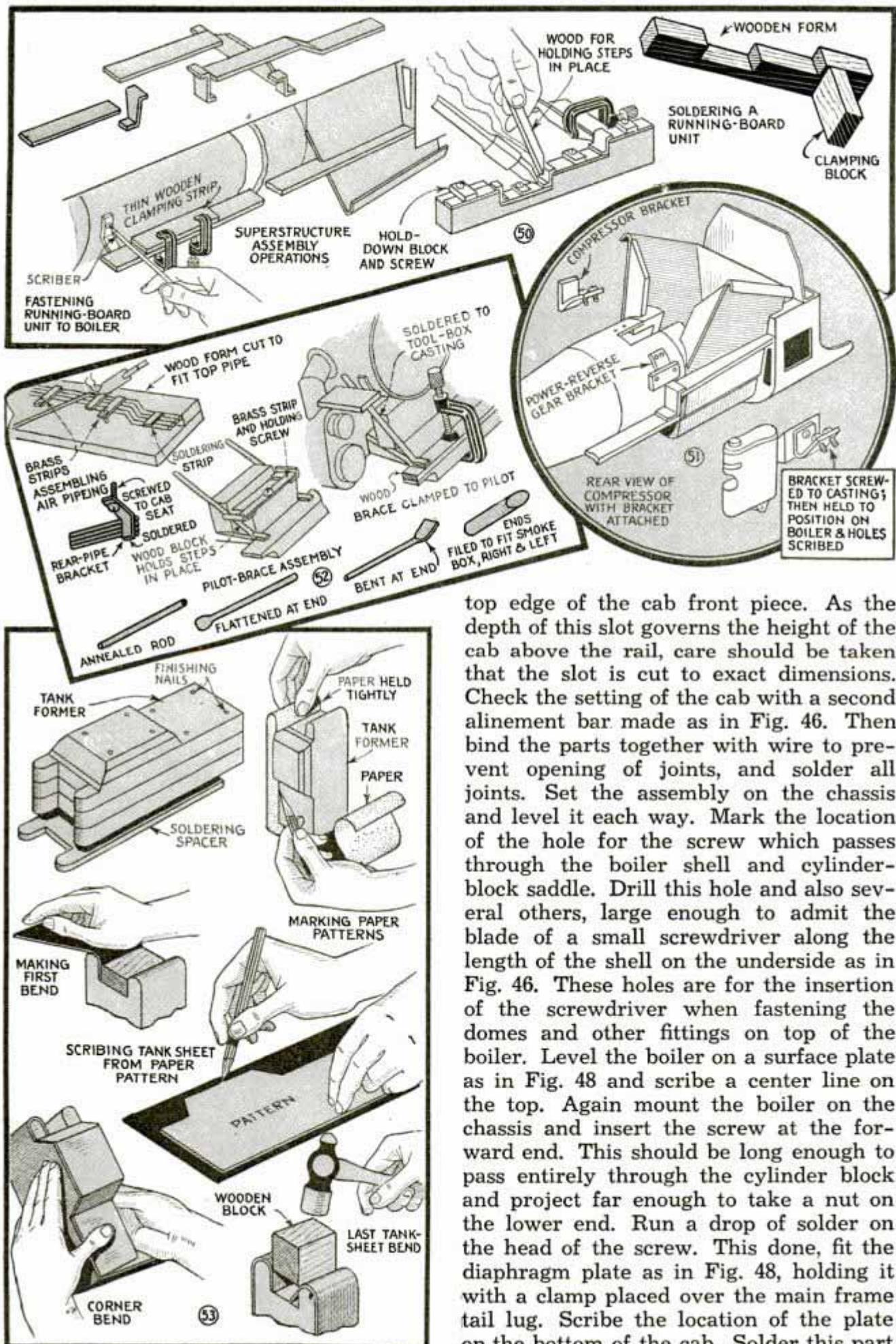
First the rim of the casting is turned down in the lathe to form a flange. The casting is then fitted to the boiler shell and held in place with small escutcheon pins, which must be a tight fit. To get the proper degree of heat to form a sound joint it will be necessary to heat this casting with a torch, turning the flame as low as possible and playing it on the points of the casting only. When the parts are sufficiently hot flow solder into the joint and before the solder cools wipe off the excess with a rag.



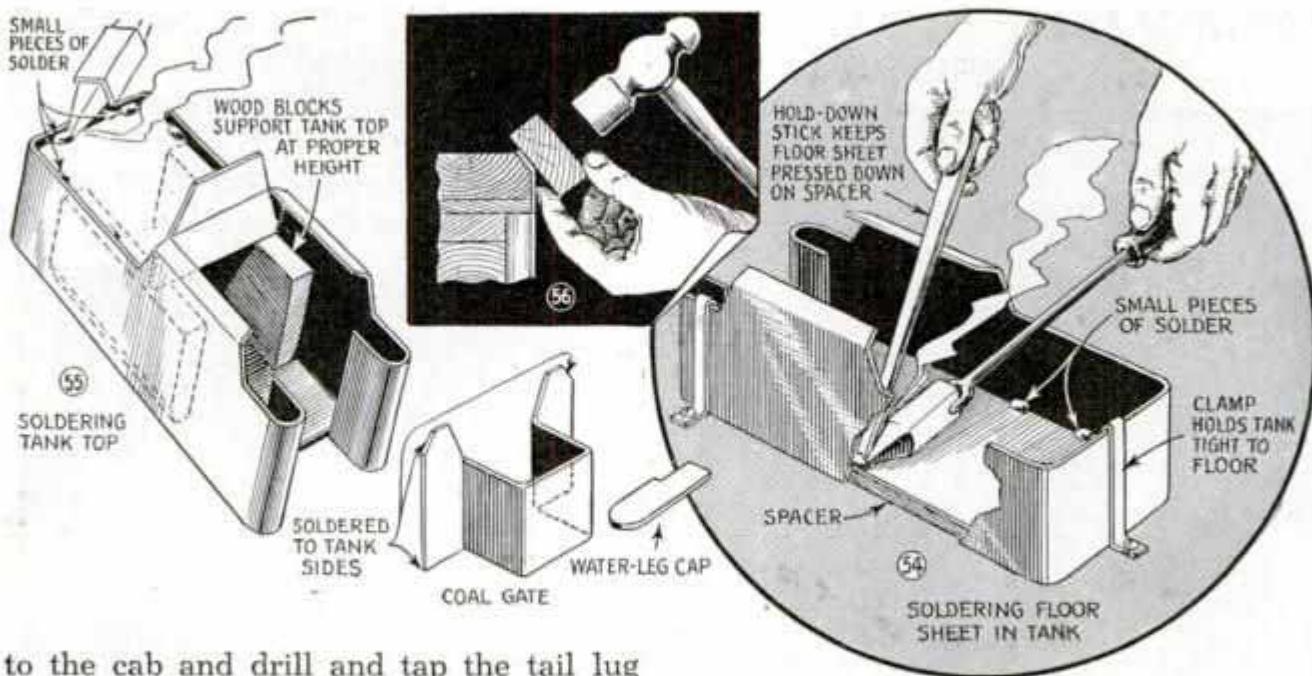
Finish this step by fitting and soldering the backhead in the fire box. Next, an alining bar, Fig. 41, is made from hardwood. Pin the fire box to the casting, alining it with the boiler by means of the alining bar and straightedges. Place the assembly on hollowed blocks to prevent its shifting about and pack the inside with wet paper pressed against the backhead. Begin heating slowly with a torch, and flow the solder into the joints with a hot iron as in Fig. 42. Leave the wet paper in place until the work has cooled completely. Then clean up the outside joints and file the heads of the pins flush.

The next job is the cab. On certain types of models the cab ends are furnished as castings to which the sheet-metal sides and top are fastened with screws. After driving the screws the joints are soldered. A careful filing of both castings and sheet-metal sides and top will insure true-fitting joints. The top of the cab is usually provided with two sliding ventilators, though three are required on some models. After assembling with screws, the parts are heated with the torch and the joints soldered with a hot iron. Though this type of cab is in more general use in model construction, the design of certain types makes it necessary to construct the cab entirely of thin sheet stock. The method of cutting the window openings in the side sheets is shown in Fig. 43. Use a jewelers' saw for this work and finish to size with a fine file. The top and sides are formed as a unit as in Figs. 44 and 45. The cab ends are sawed to form from heavier stock, and when the joints have been fitted the parts are clamped together on a form and soldered. In fitting the cab to the boiler the top of the fire box is slotted to take the





top edge of the cab front piece. As the depth of this slot governs the height of the cab above the rail, care should be taken that the slot is cut to exact dimensions. Check the setting of the cab with a second alinement bar made as in Fig. 46. Then bind the parts together with wire to prevent opening of joints, and solder all joints. Set the assembly on the chassis and level it each way. Mark the location of the hole for the screw which passes through the boiler shell and cylinder-block saddle. Drill this hole and also several others, large enough to admit the blade of a small screwdriver along the length of the shell on the underside as in Fig. 46. These holes are for the insertion of the screwdriver when fastening the domes and other fittings on top of the boiler. Level the boiler on a surface plate as in Fig. 48 and scribe a center line on the top. Again mount the boiler on the chassis and insert the screw at the forward end. This should be long enough to pass entirely through the cylinder block and project far enough to take a nut on the lower end. Run a drop of solder on the head of the screw. This done, fit the diaphragm plate as in Fig. 48, holding it with a clamp placed over the main frame tail lug. Scribe the location of the plate on the bottom of the cab. Solder this part



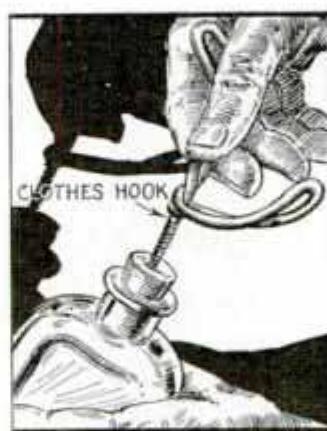
to the cab and drill and tap the tail lug for screws to hold the plate. This is the usual method of mounting the boiler on the chassis of electrically driven models.

The boiler trimmings, smoke-box rivets, handrails, domes, stack and bell, turbo-generator, piping and other small details can now be added. Most of these parts are castings and all that will be necessary is some light filing to insure a true fit on the curve of the boiler. To locate the position of the handrail supports, scribe lines on the boiler as in Fig. 49, and plug the end of the boiler with a wooden disk to act as a guide for the hermaphrodite caliper used in scribing the line for the smoke-box rivets. Small escutcheon pins are just right for rivets on most small-scale models. Methods of forming and attaching running boards, pilot braces and other details, are shown in Figs. 50, 51 and 52 and though the shape and size of these parts vary in different locomotives the procedure in making and attaching them is the same. With all these parts in place the boiler is ready for the smoke-box end and the headlight. Flange the casting in the lathe to fit the smoke-box end of the boiler shell. Solder in place and fit the hood for the electric headlight as in Fig. 47.

Methods of building a tender tank are clearly shown in Figs. 53 to 56 inclusive. The procedure is essentially the same as that in making the boiler shell only that the sheet metal is cut with a paper pattern as in Fig. 53. This is necessary because most tender tanks are formed from a continuous sheet. Due to the light gauge

of the metal used, soldering is a simple job. The tank is filed lightly to fit the tender frame, and is fastened in place with machine screws turned into tapped holes in the frame. Addition of steps and grab irons completes the locomotive ready for painting. Before doing so, it is better to disassemble both superstructure and chassis. Use a flat-black boiler paint for the superstructure and a very high-grade enamel for the chassis. All parts must be clean and free from all traces of soldering flux or oil.

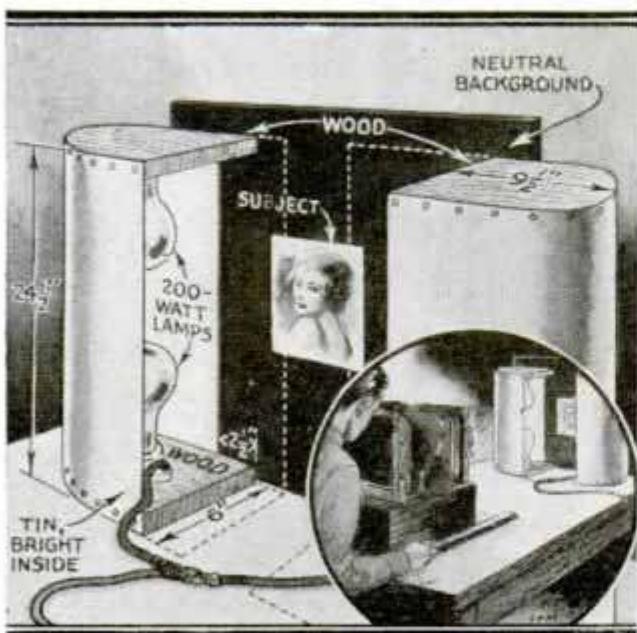
Clothes Hook Used to Remove Corks from Bottles



When a corkscrew is needed and none is at hand, get a clothes hook, and screw the threaded part into the cork. The hooks have deep threads, which will bite into the cork so that it can be pulled out.

Turpentine, or a solution of oxalic acid, applied to the tops of enameled letters on glass, and allowed to soak down through the cement, will loosen it so that the letters can be removed easily.

Floodlight Arrangement for Copying with a Camera



*Floodlight Reflectors for Copying with a Camera
Made from Bright Tin Nailed to Wood End Pieces*

For copying photos and similar work where it is necessary to eliminate shadows, the lighting arrangement shown will be found handy and can be made by anyone. Two reflectors, each containing two 200-watt lamps, are set near the ends of a black background about 30 in. square. The reflectors are made of bright tin, which is nailed to wood end pieces, the tin on the inner sides of the reflectors being set back about 2½ in. from the open side so that the light will be reflected on the subject to be photographed. The lamps are screwed into porcelain sockets fastened to the wood ends of the reflectors.

Rubber Heel Serves as Pad When Pointing Wood Stakes



block and should be driven deeply into

Nailed to a wood block, a rubber heel taken from an old shoe provides a good pad on which to rest a wood stake while pointing it with an ax or hatchet. Finishing nails should be used for attaching the heel to the

the surface of the rubber so the blade of the ax or hatchet will not be damaged when it strikes the pad.

Portions of Envelopes Hold Contents of Mailing Tube in Place

When a mailing tube is used occasionally, each end can be closed by sticking the gummed flap of an envelope to the outside of the tube and pushing the front part of the envelope inside. For convenience, the rest of the envelope is cut off as shown in the photo.—F. W. Bentley, Jr., Missouri Valley, Ia.



Child's Bed Covers Held Down with Clothespins

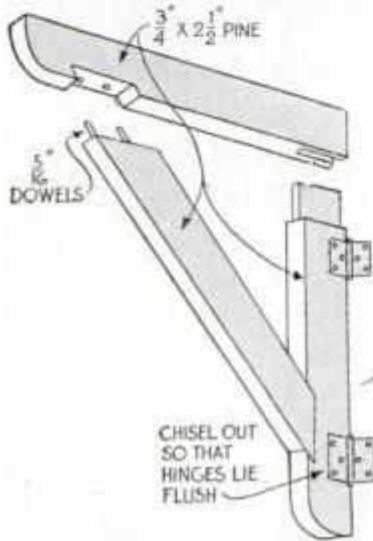
To prevent a small child from kicking off the covers at night, one woman stretched wire between the bed posts along the sides, head and foot of the bed and then fastened the edges of the covers to the wire with



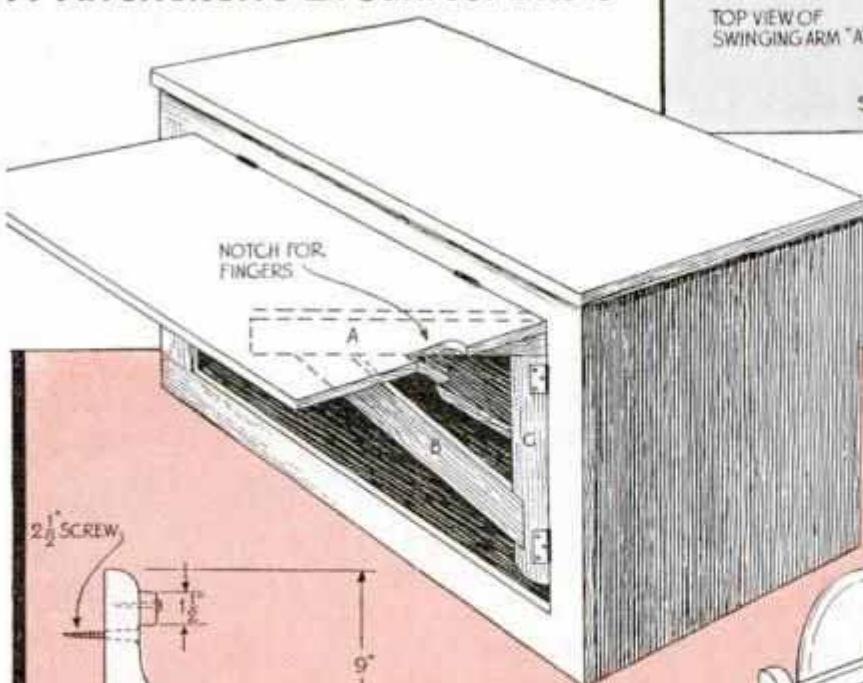
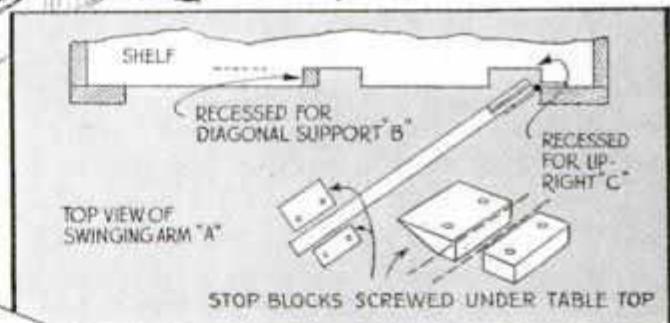
Covers Fastened to Wire around Bed to Prevent Child from Uncovering Itself

spring-type clothespins. The wire should be wrapped tightly around each post, and should be placed near the lower edge of the mattress so that it will not interfere when making the bed.

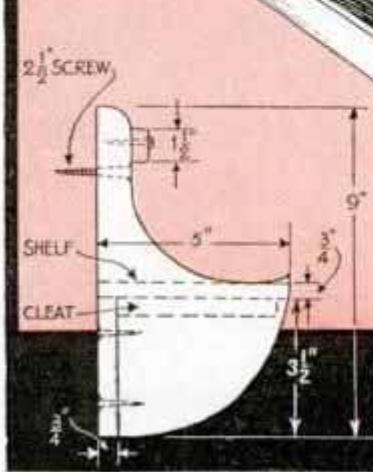
Space Savers for the **COMPACT KITCHEN**



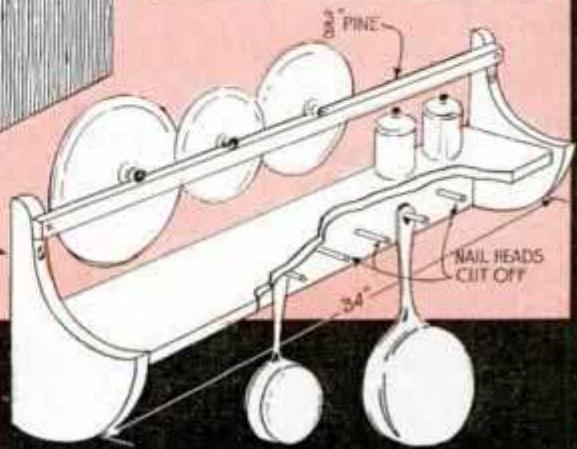
A Kitchenette Breakfast Table

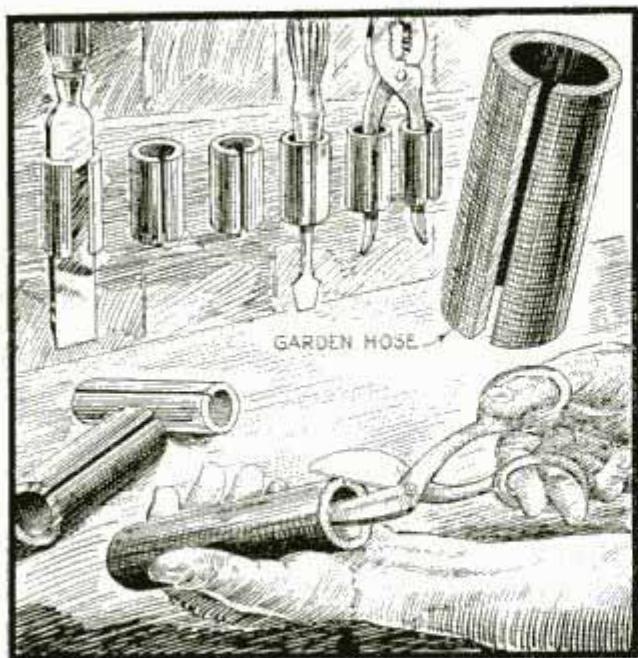


Hinged to the Front of a Kitchen Cabinet, a 3/4-In. Plywood Panel Gives Extra Table Space and Can Be Dropped to Be Flush with the Cabinet When Not in Use; Another Convenience Is a Pot and Lid Rack Shown Below



*A Handy Pot
and Lid Rack*





Cut Lengthwise and Nailed to the Wall, Pieces of Hose Make Good Tool Holders

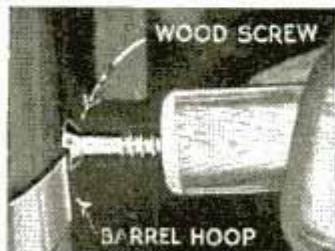
Short Pieces of Garden Hose Hold Small Tools

Neat, flexible tool holders can be had by slitting short pieces of garden hose along the sides and then nailing them to the wall or backboard above your work-bench. For pliers and narrow chisels, the hose need not be slit, but can be toenailed to the wall. Also, holders for hand saws may be made by slitting the hose about one half its length on opposite sides.

Simple Tool for Tightening Hoops on Barrels and Kegs

The usual difficult job of tightening hoops on wood barrels, kegs, tubs, etc., is done easily with a little tool made by driving a large wood screw into the end of a hardwood stick and filing down half of the top surface of the head so that it will engage the hoop as shown in the photo.

A few light hammer blows struck near the head of the screw will tighten the hoop. A stronger tool, which is used



in the same way, can be made by recessing one end of a $\frac{1}{4}$ or $\frac{1}{2}$ -in. iron rod to leave a lip, which is then fitted over the edge of the hoop in the same manner as the screw.

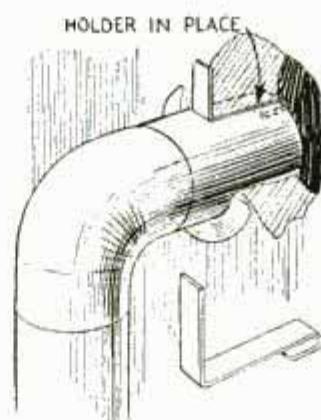
Medicine Dropper Handy on Bottle

A medicine dropper will always be at hand when needed, if it is kept on a simple holder which is made by pushing a hairpin through the cork at right angles to the side of the bottle. The looped end of the hairpin can then be spread to hold the dropper, which is inserted with the bulb end upward as shown.



Metal Stop on End of Stovepipe Assures Full Draft in Stove

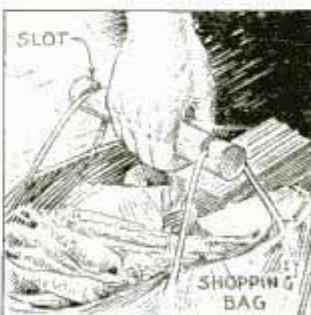
If a stovepipe is pushed too far into the chimney hole, draft is impeded and soot accumulates at the end of the pipe, often causing a fire hazard. To prevent this,



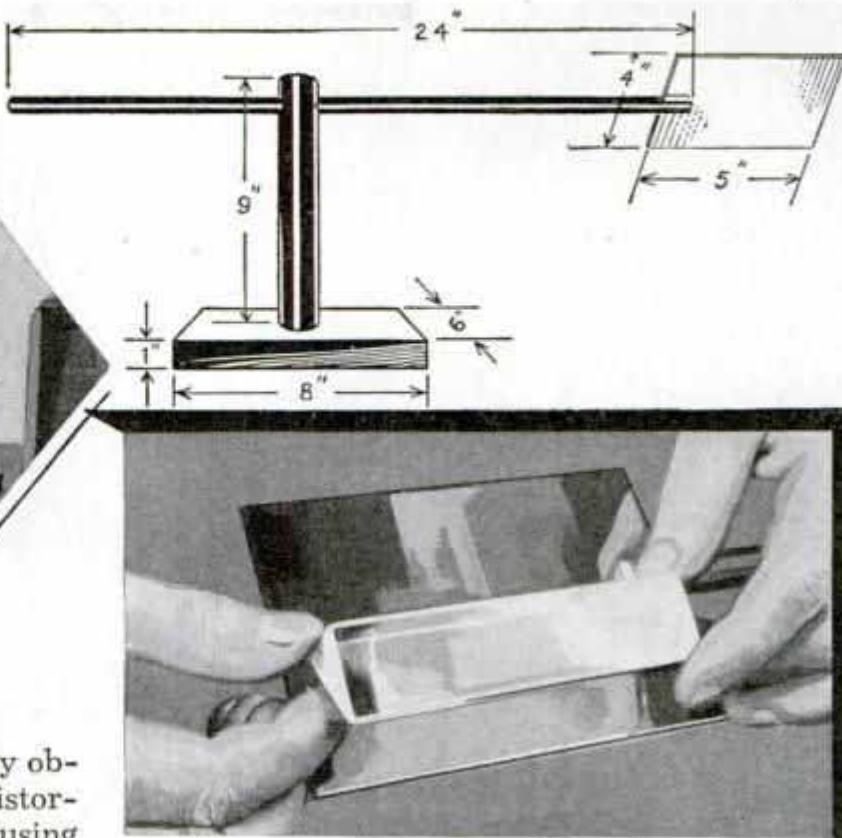
take a strip of sheet metal, bend one end over the edge of the pipe and then bend the other end up at right angles so that it serves as a stop against the outside surface of the chimney when the pipe is pushed into the hole.

Hand Grips for Carrying Heavy Shopping Bags

Slotted near the ends as shown, a short length of large dowel rod or broomstick provides a grip for carrying heavy shopping bags without hurting the hands. The cord handles of the bags are slipped into the slots, cut at an angle. As many storekeepers put their customers' packages in shopping bags, it is a good idea to take a couple of these grips along on your shopping trip.



Glass Held at Angle to Copy by Reflection

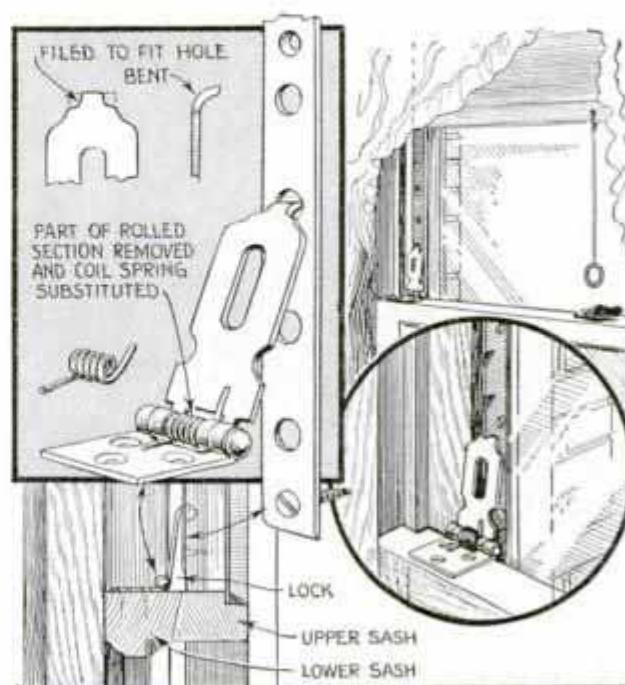


Pictures, photos or stationary objects can be copied without distortion or false perspective by using this copying device. It consists of a small piece of plate glass held on a support of the kind detailed, which permits turning the glass at any desired angle. With a sheet of drawing paper on the table directly under the glass, the latter is adjusted until, looking down through it, you see the image of the subject to be drawn.

While copying, the eyes must remain in one position or, a piece of cardboard with a peep hole cut in it may be attached above the glass. If you wish to have the picture reversed, you can hold a glass prism in front of the glass in line with the subject to be copied.

Lock Prevents Intruder Entering House through Window

Unless this lock is held back while opening a window, it restricts upward movement of the lower sash and downward movement of the upper sash, thus you can raise the window to admit air and be reasonably certain that no intruder can get in. To make the lock, get a strip of flat brass or steel and a padlock hasp. Remove the hasp pin and grind the parts back for insertion of a small coil spring as indicated. The hasp is then screwed to the top of the lower sash and the strip of brass, which is either drilled or notched, is screwed to the side of the upper sash. The spring causes the hasp to catch in the holes or notches when the window is raised, but slides past them when it is lowered. The hasp should engage the lowest hole when the window is closed.



Fibre cord and rush
Thruslon manual
Training Supply Co., Wichita, Kansas



WINDSOR CHAIRS

Louis M. Thompson, Instructor, Allerton, Boston, 34 Years
33
WINDSOR chairs have been popular for over two centuries, a record that no other style of furniture has equaled, and today they are as much in demand as ever. There is a legend about the origin of Windsor chairs which recounts how King George I of England sought shelter in a peasant's hut during a storm and there rested in a chair unlike any he had ever seen before. The chair, which had been fashioned by the village wheelwright, was so comfortable that the king had it transported to Windsor castle and hence the name of the chair.

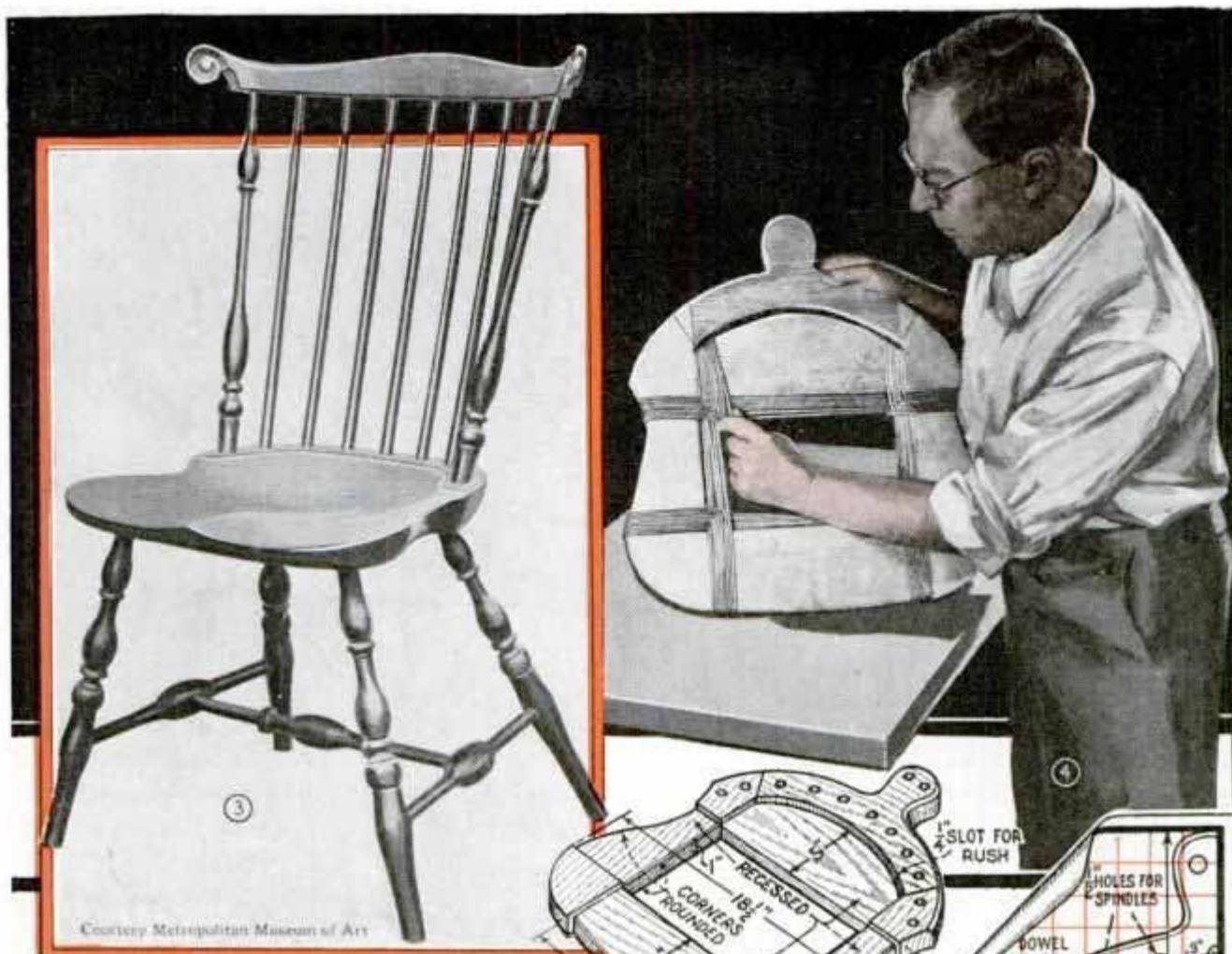
The bow-backed Windsor chair shown in Fig. 2 is considered the most popular of all. It is light, comfortable and sturdy, yet the construction is quite simple. As most of the measurements are taken from the seat, this seems the logical part to make first. It consists of a wood frame wrapped with ~~rush~~. Rush seats were not used on the very early American Windsors but, when once used, added so much to the comfort and durability of the chair that the rush seat came into great favor in later years. Fig. 6 is a layout of the seat frame, from which a full-size pattern should be

You can build

By R. O. BUCK
Lane Technical High School
Chicago

made. The seat frame consists of five pieces joined together with $\frac{3}{8}$ -in. dowels. To have the top of the rush flush with the surface of the wood, the side and front pieces are recessed $\frac{1}{8}$ in. on each side and at the edges, as in Fig. 5. At the back a 1-in. piece is set in, allowing $\frac{1}{4}$ in. between it and the back piece through which the rush may be drawn. All edges over which the rush is to be wrapped must be well rounded so that the material will not be cut. While twisted rush can still be obtained from supply houses, a more durable material called fiber cord, which is made of paper wrapped around flexible wire, is suggested. When the work has been shellacked, it is difficult to tell the difference between the two materials though the latter is much less expensive. Fig. 8 shows the method of wrapping the seat. The beginning end of the rush or fiber cord is tacked to the underside of the frame, then

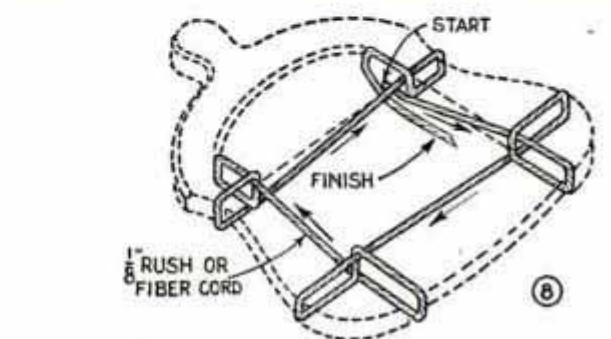
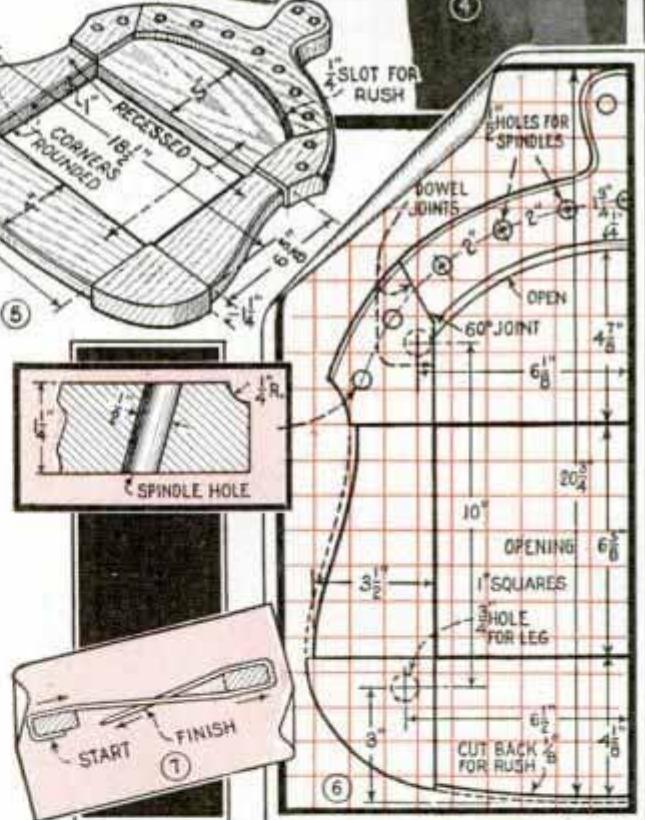
American Fibre Cords Inc., Worcester, Mass.

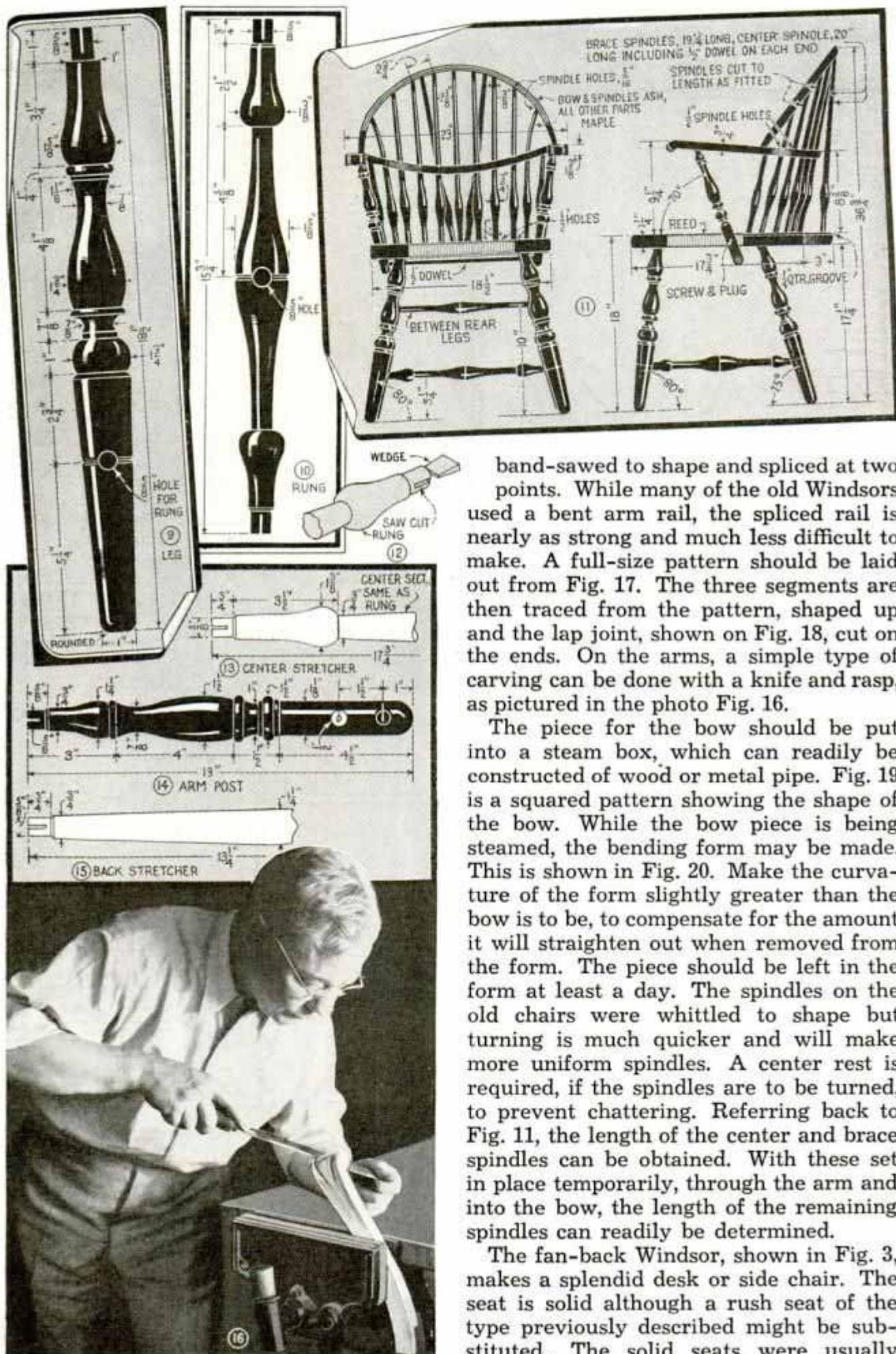


Courtesy Metropolitan Museum of Art

carried up, over the corner and across to the opposite corner. Force the strands tight together at the corners, as in Fig. 4. The wrapping operation is continued, making splices with brads on the underside as required, until the diagonal lines from the corners meet. The fiber or rush is then woven back and forth between the front and back rails, as in Fig. 7, until the center portion has been filled also. Fiber or rush seats should be given three coats of thin shellac.

Fig. 11 is a working drawing of the complete chair. The seat is lower at the back than it is at the front. The legs should all be made the same length and cut to length afterward. Fig. 9 shows the turnings for the legs. It is the custom on these chairs to make a V-cut with a skew chisel at the points where the holes for the rungs are to be bored. Fig. 1 shows how this is measured off on the lathe. The rungs, center stretcher and arm post are shown in Figs. 10, 13 and 14, and the plain back stretcher is shown in Fig. 15. The turned pieces are glued and wedged into their holes as shown in Fig. 12. The arm rail is

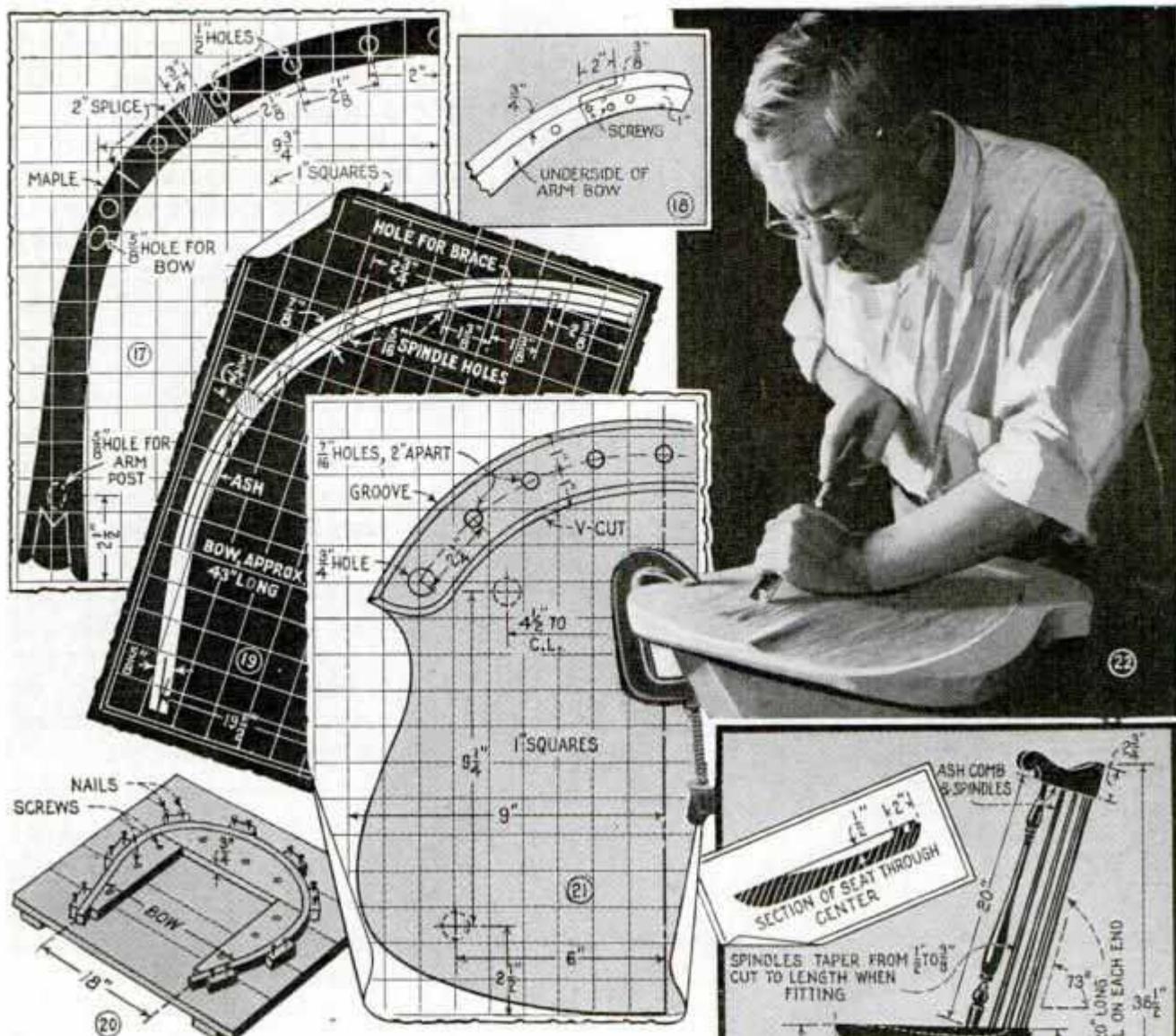




band-sawed to shape and spliced at two points. While many of the old Windsors used a bent arm rail, the spliced rail is nearly as strong and much less difficult to make. A full-size pattern should be laid out from Fig. 17. The three segments are then traced from the pattern, shaped up and the lap joint, shown on Fig. 18, cut on the ends. On the arms, a simple type of carving can be done with a knife and rasp, as pictured in the photo Fig. 16.

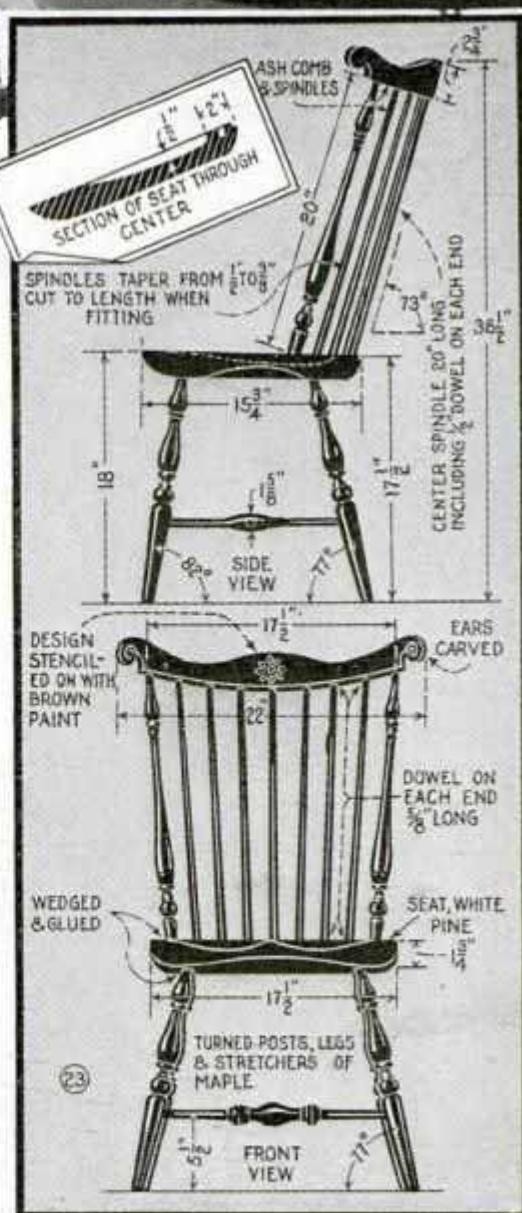
The piece for the bow should be put into a steam box, which can readily be constructed of wood or metal pipe. Fig. 19 is a squared pattern showing the shape of the bow. While the bow piece is being steamed, the bending form may be made. This is shown in Fig. 20. Make the curvature of the form slightly greater than the bow is to be, to compensate for the amount it will straighten out when removed from the form. The piece should be left in the form at least a day. The spindles on the old chairs were whittled to shape but turning is much quicker and will make more uniform spindles. A center rest is required, if the spindles are to be turned, to prevent chattering. Referring back to Fig. 11, the length of the center and brace spindles can be obtained. With these set in place temporarily, through the arm and into the bow, the length of the remaining spindles can readily be determined.

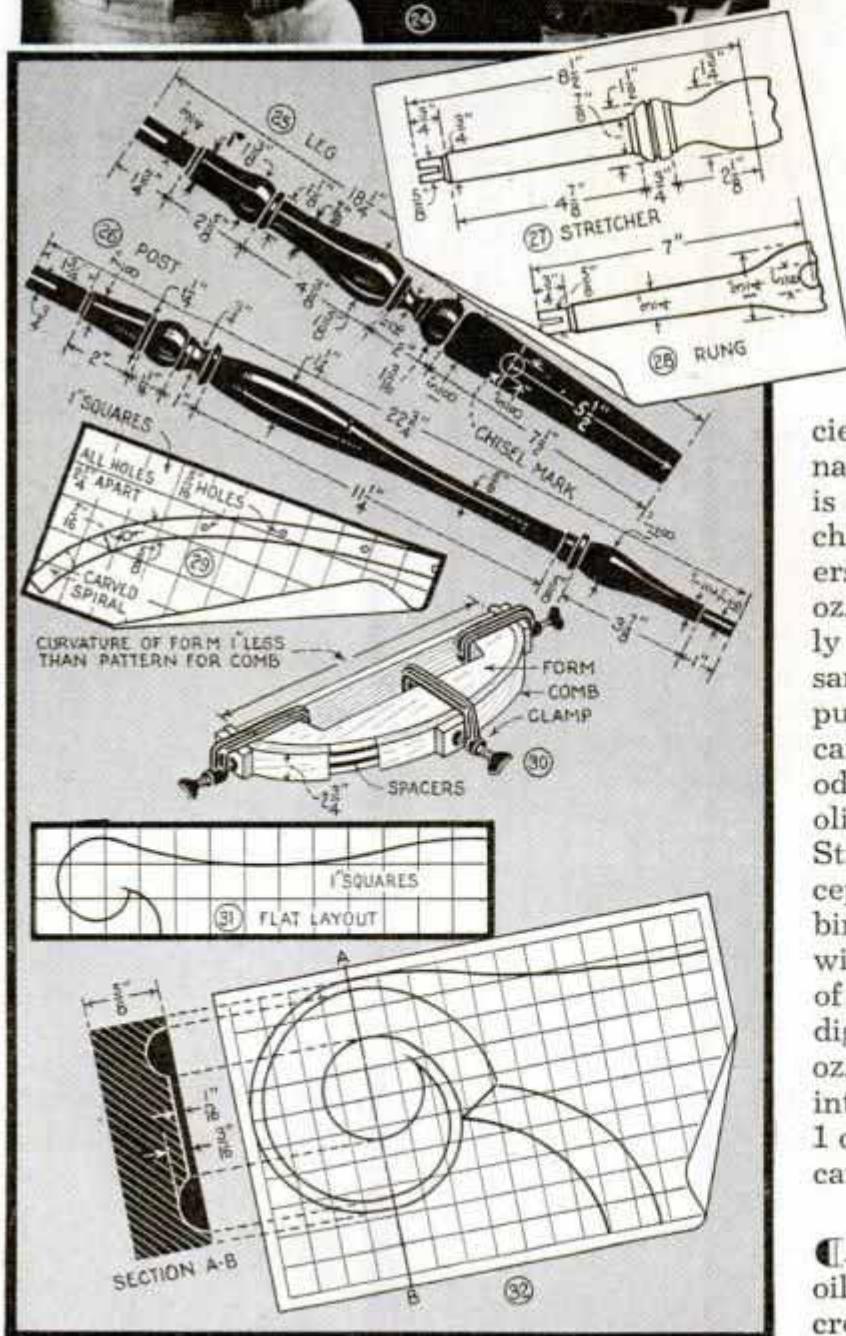
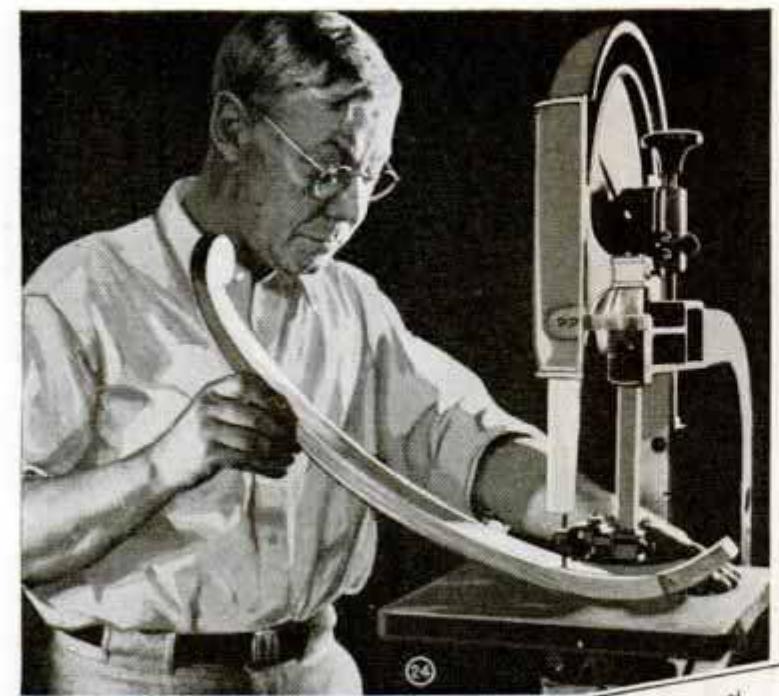
The fan-back Windsor, shown in Fig. 3, makes a splendid desk or side chair. The seat is solid although a rush seat of the type previously described might be substituted. The solid seats were usually



made of a wide piece of white pine, sawed to the shape shown in Fig. 21. To make them more comfortable it was customary to hollow out the seat slightly with a gouge, as in Fig. 22. Fig. 23 is a working drawing of the chair. The type of turning is quite similar to that used on the bow back and the construction is the same. Figs. 25, 26, 27 and 28 show the dimensions of the turned pieces. The comb presents the only really difficult problem on this chair. It must be steamed and bent to the shape shown in Fig. 29. To do this, a form must be constructed with a slightly greater curvature than the piece is actually to have. Three layers of $\frac{3}{4}$ -in. material with $\frac{1}{4}$ -in. spacers are suggested rather than a solid form, as the comb will dry more readily on a ventilated form. Fig. 30 shows the method of clamping the piece to the form after it has been steamed to a pliable state.

The shaping of the comb is done on the bandsaw after it has been bent, as in Fig. 24. A full-size pattern of the flat layout should be made from Fig. 31, and the curve and spiral ears carefully traced out on the piece. The carving on the





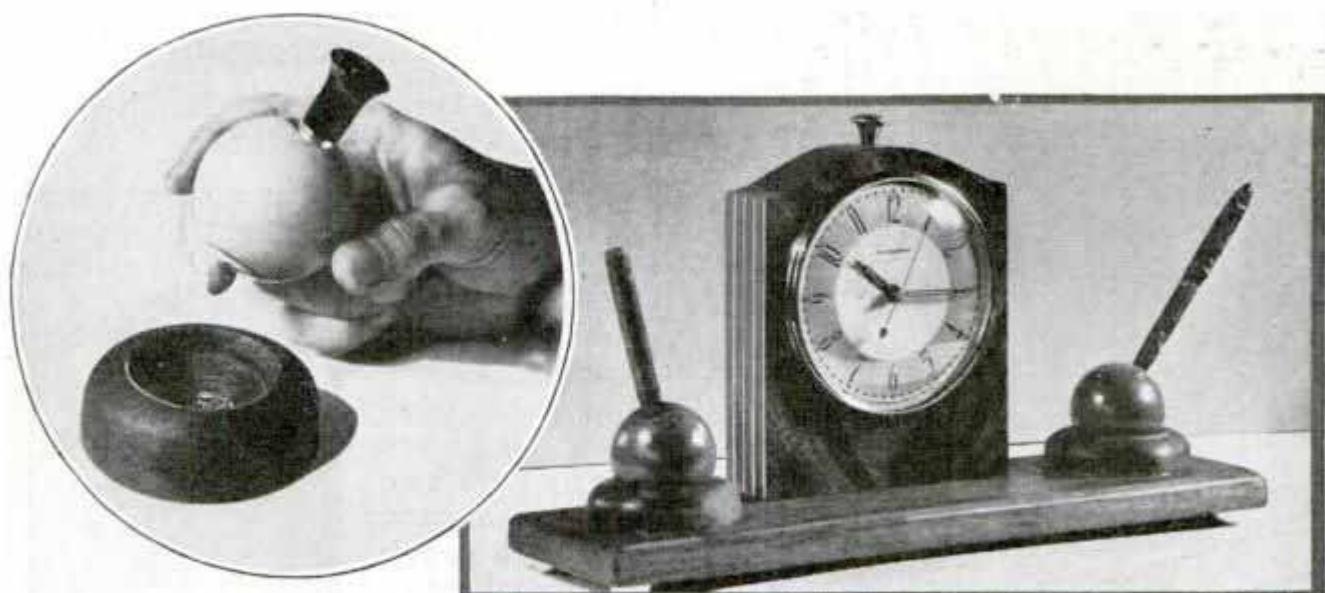
ears is one of the marks by which a fine fan-back Windsor is judged. The design is simple and should be cut in boldly and rather deep, as in Fig. 32. The assembling of the back is accomplished by setting the center spindle first, to the angle given in Fig. 23, followed by the posts and remaining spindles. Old Windsors were usually painted because of the several kinds of wood used for the various members. With modern stains and finishing materials, all of the members can be finished to look so much alike that a varnish finish is quite practical. The design shown at the center of the comb is simply stenciled on after the chair has been finished, if you want to make your reproduction authentic, or may be omitted as is usual on modern Windsors.

Cleaning Fluids That Are Not Inflammable

An excellent dry-cleaning fluid that combines the efficient grease-dissolving powers of naphtha and carbon tetrachloride is made by mixing carbon tetrachloride, 3 gal., deodorized cleaners' naphtha, 1 $\frac{3}{4}$ gal., benzol, 24 oz. and chloroform, 2 oz. A slightly less expensive cleaner of the same type that is suitable for most purposes, may be made by mixing carbon tetrachloride, 3 $\frac{1}{8}$ gal., deodorized gasoline, (not Ethyl gasoline) 3 gal. and chloroform, 2 oz. Still another cleaner that is exceptionally quick acting and combines the detergent action of soap with the grease-dissolving ability of solvents is made by mixing diglycol oleate, 1 oz. and water, 1 oz. This mixture is then stirred into a solution of butyl cellosolve, 1 oz., isopropyl alcohol, 10 oz., and carbon tetrachloride, 14 ounces.

A little spar varnish in exterior oil paint will toughen it and increase its luster.

Billiard-Ball Penholders in a Novel Desk Set

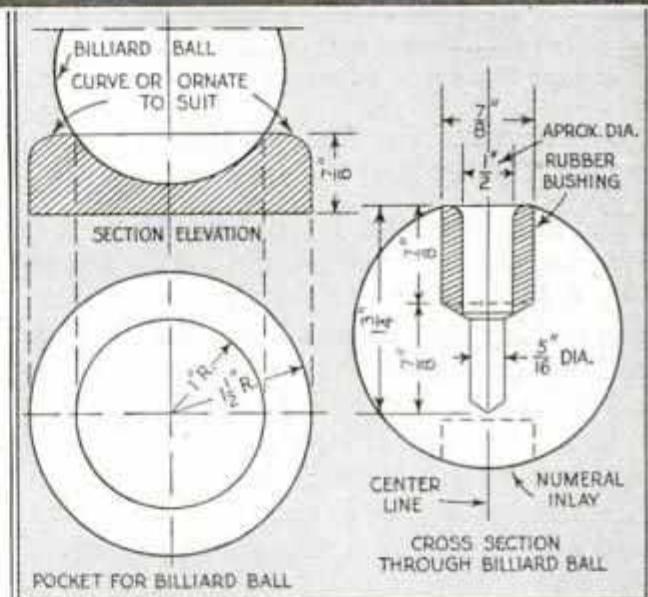


Billiard balls, placed in turned wooden pockets on a desk set, have sufficient weight to hold a pen and pencil in any position as the balls can be rotated in all directions. Composition balls are used for this purpose as they can be drilled readily. Remove one of the numeral inlays and drill a hole, which, when fitted with a rubber bushing, will take the pen or pencil. The diameter of the holes and the thickness of the bushing depend on the size of the pen or pencil, although the average size pen will fit in a hole of the size given in the detail. A small hole is drilled through the opposite numeral inlay to break into the pen socket; this prevents a vacuum caused by a tight-fitting pen and the leakage of ink when the pen is drawn out. If desired, special pen sockets, such as are used in commercial sets, may be fitted in the ball instead of a rubber bushing to provide a more finished appearance.

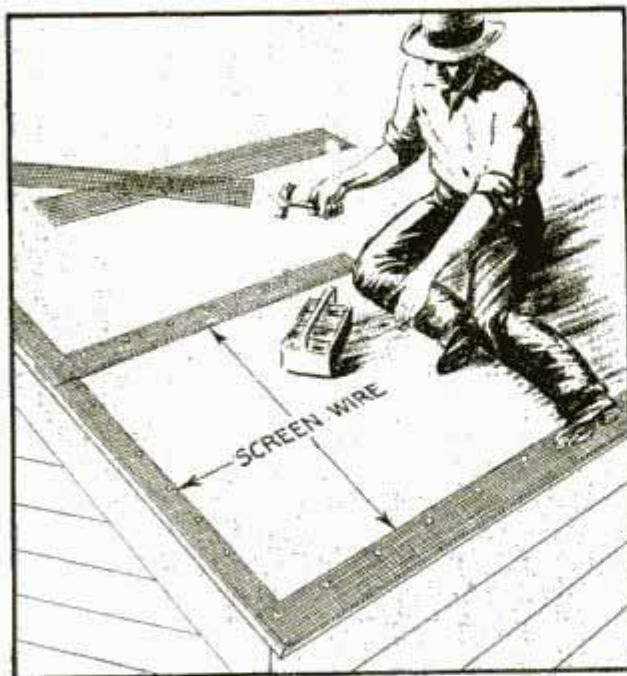
—F. D. Glenn, Chicago.

Household and Office Paste That Dries Plastic or Pliable

A paste that is suitable for office or home use and is pliable when dry can be made by beating to a paste cornstarch, 4 oz., white dexterine, 2 oz., and cold water, 10 oz. An egg beater may be used to work the ingredients to a smooth, even consistency. In a separate container, dissolve borax, 1 oz., in boiling water, $\frac{1}{2}$ gal., and add glycerine, 3 oz. After stirring the



solution, the starch paste is vigorously stirred into it with the egg beater until the paste is smooth. This paste may be used for fastening paper, leather or fabric. If a few drops of 10-per-cent carbolic acid are added to the borax solution before stirring in the starch mixture, the paste will keep well. A less expensive paste that is serviceable for many purposes is made by working ordinary flour, 2 lbs., into an even paste with cold water, 1 qt. Care must be taken to break up all lumps completely. In a separate container, dissolve alum, 1 oz., in hot water, 4 oz. To complete the paste, slowly pour the flour paste into boiling water, 3 qts., while stirring vigorously. When the proper consistency has been reached, add the alum solution and stir to complete the paste.

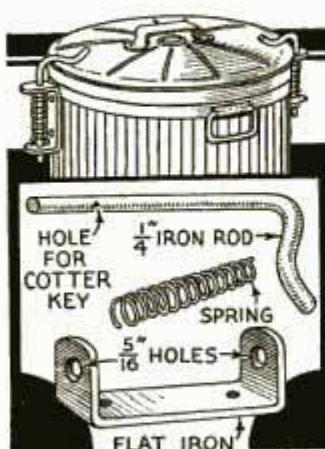


Strips of Screen Wire Folded over Edges of Roll Roofing Prevent Wind from Tearing It Loose

Screen Wire Stiffens Edges of Roll Roofing

The next time you lay roll roofing get a few yards of screen wire, cut it into strips 3 or 4 in. wide and fold these over the ends and lapped edges of the roofing before nailing it down. This strengthens the edges and seams of the roof so that a strong wind will not tear it loose. A coat of roofing paint each year will keep the screen wire from rusting. A strip of brass linoleum edging will also serve the purpose.

Spring Clamps Prevent Dogs Getting Cover Off Garbage Cans



and attached to opposite sides of the can by means of U-shaped flat-iron brackets. A compression spring between the ends of each bracket kept the clamps tightly

unable to keep dogs out of a garbage can, one man rigged up a pair of spring clamps, which held the cover securely, yet permitted it to be removed easily when necessary. The clamps were made from short iron rods bent to the shape shown

against the cover. The clamps were drilled near the lower ends for cotter keys to hold the assembly together.

Scoop Cork for Large-Mouth Chemical Bottles

To aid in measuring small quantities of dry chemicals, you will find that a scoop attached to the corks will simplify matters considerably. Cut pieces of light-gauge tin to the shape shown, leaving small, sharp prongs on one side. Then bend them to a scoop shape and force the prongs into the corks to hold them firm. By tipping the bottle, one may fill the scoop before removing the cork.



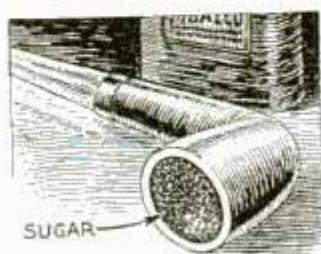
Wax Increases Life of Gut Violin Strings



To increase the life of gut violin strings, one player recommends an application of melted paraffin to the portion of the strings over the fingerboard. Moisture on the fingers has a tendency to cause the strings to unravel, and become rough. Do not get the paraffin over the part just below the bridge where the bow is drawn over the strings.

Burned Sugar Breaks In New Pipe

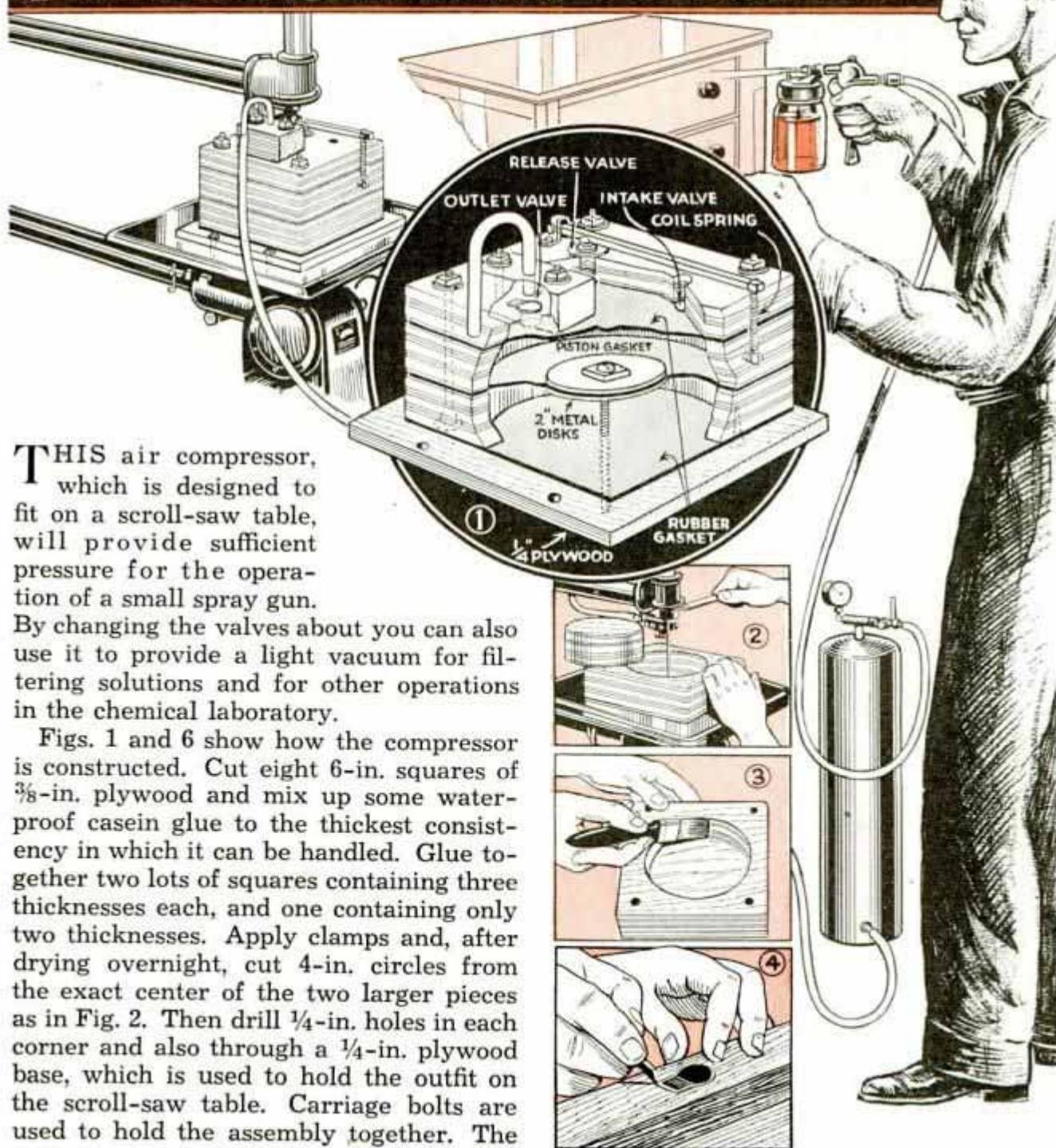
Before filling a new pipe for the first smoke, moisten the inside surface of the bowl and coat it with powdered sugar, rolling the pipe to get the sugar distributed evenly. The sugar will burn and coat the bowl with the first smoke, thus eliminating the usually distasteful job of breaking in the pipe.





SHOP NOTES

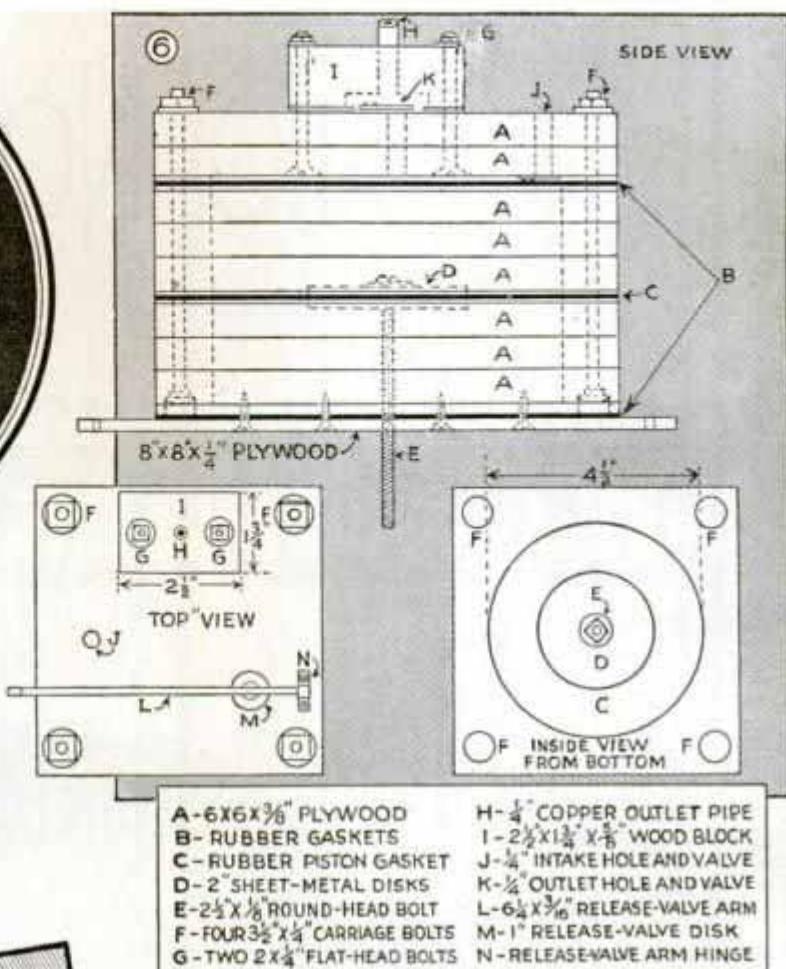
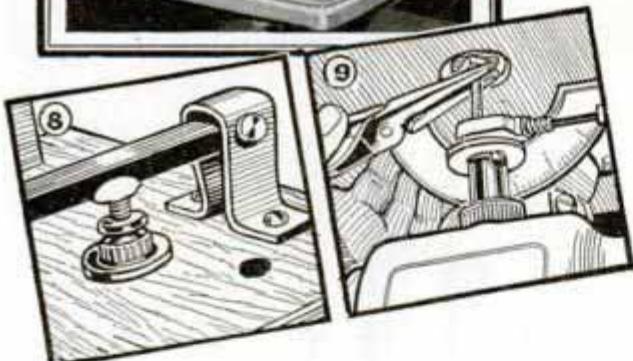
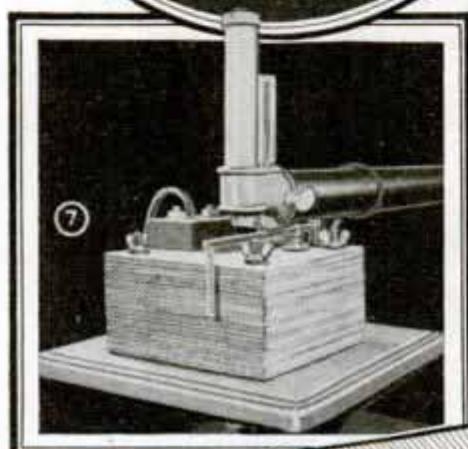
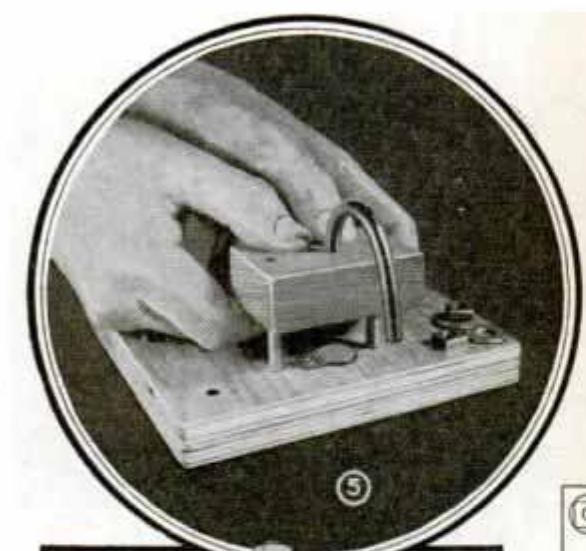
Scroll Saw runs this AIR COMPRESSOR



THIS air compressor, which is designed to fit on a scroll-saw table, will provide sufficient pressure for the operation of a small spray gun.

By changing the valves about you can also use it to provide a light vacuum for filtering solutions and for other operations in the chemical laboratory.

Figs. 1 and 6 show how the compressor is constructed. Cut eight 6-in. squares of $\frac{3}{8}$ -in. plywood and mix up some waterproof casein glue to the thickest consistency in which it can be handled. Glue together two lots of squares containing three thicknesses each, and one containing only two thicknesses. Apply clamps and, after drying overnight, cut 4-in. circles from the exact center of the two larger pieces as in Fig. 2. Then drill $\frac{1}{4}$ -in. holes in each corner and also through a $\frac{1}{4}$ -in. plywood base, which is used to hold the outfit on the scroll-saw table. Carriage bolts are used to hold the assembly together. The



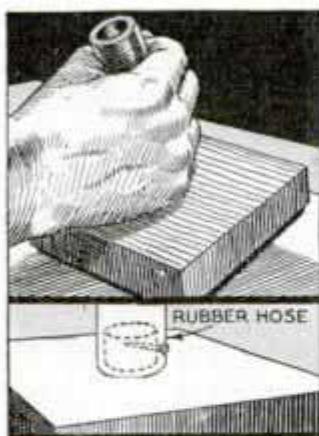
holes should be countersunk so that the bolt heads will fit flush. To seal the pores of the wood against the slightest leakage of air the inside portions are given a coat of water glass as in Fig. 3, followed by a coat of strong lime-chloride (not chlorinated lime) solution. This will make the water glass as hard as stone, and waterproof. You can then drill holes for the three valves, according to the drawing specifications. The valves are pieces of $\frac{1}{1000}$ -in. brass shim stock cut to shape with scissors. A piece of rubber is cemented to one side, a short tab being left for fastening with screws or brads. The surface around the valve hole must be sanded smooth so that the rubber will be held in firm but light contact. Before fastening down the outlet valve mark around it as

in Fig. 4 on a wood block and route the space out to a $\frac{1}{4}$ -in. depth. The block, with copper outlet tube cemented in with thick casein glue, is fitted down over the valve as in Fig. 5. The tube can be bent without trouble with the hands if care is used to curve it very gradually.

The release or "blow-off" valve is a 1-in. metal disk covered on the bottom with rubber and with the binding post from a dry cell soldered to the top. This makes it adjustable when screwed to the short bolt soldered to the release arm as in Fig. 8, which also shows the arm hinge made with a bent strip of steel. The other end of the arm is held down by a light coil spring and not much tension is necessary because of the leverage obtained by this arrangement. Rubber gaskets, fitted at the points indicated, are cut from inner tube. The middle gasket has only a small hole in its center and really forms a part of the piston, which consists of two 2-in. sheet-metal disks held together with a small round-head bolt. This size has been found satisfactory but 3-in. disks will give more pressure and may be substituted later, after the compressor has been tested.

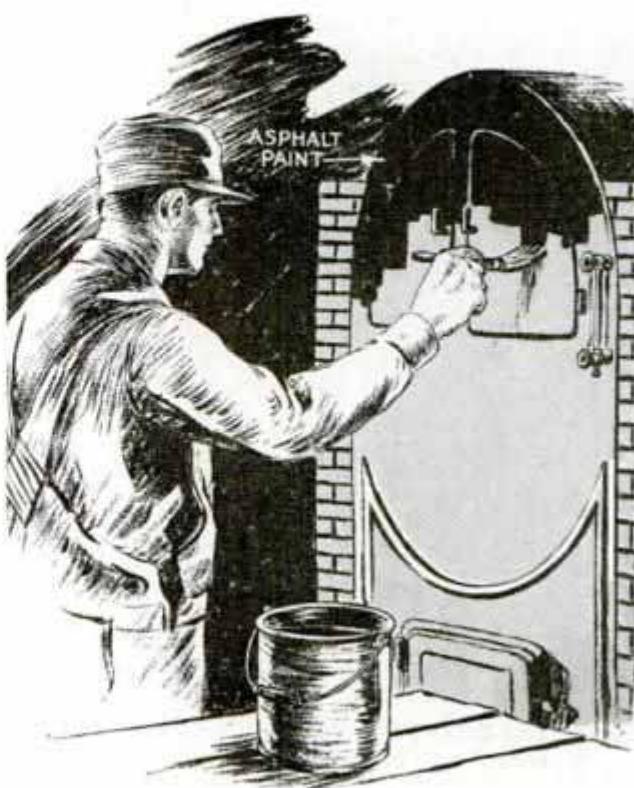
In putting the parts together it should be noted that the two top parts could be glued together but this is not advisable as the intake valve and bolts holding the outlet valve block would then be less accessible. As it is important to avoid the slightest air leakage, both sides of the gaskets should be given several coats of rubber cement. When fitted to the top of the scroll saw shown, the blade, blade guide and hold-down and the table insert were removed, the compressor being accurately set in place as in Fig. 7. C-clamps may be used to hold the compressor base to the saw table or bolts may be used through holes drilled in the table. The piston bolt is drawn down as in Fig. 9 and fastened in the chuck when the latter is at its lowest point. Adjust the saw speed by using a small pulley on the motor, to give about 500 r.p.m. You can speed it up later if desired. Test everything by turning the pulley by hand, to see that adjustments are correct. Do not expect the compressor to supply enough pressure for filling auto tires as it is only designed for light duty. An air-storage tank fitted with an air gauge shut-off cock and a valve from an old auto tire can be connected in the line to supply a uniform pressure.

Rubber Hose Provides Flexible Handle for Large Rubber Stamp



with a small nail as shown. Also, the flexibility of the hose makes the stamp produce a full impression whether it strikes the paper parallel or at a slight angle.

CAluminum can be melted in an ordinary crucible, but a flux should not be used, as a chemical combination will likely result.



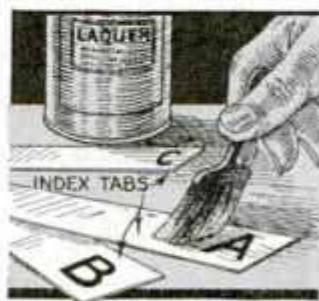
Paint Mixed with Common Asphalt as a Base Is Not Affected by Heat from Boilers

Inexpensive Paint for Boilers and Smokestacks

For protecting exposed surfaces of boilers and smokestacks, a paint that dries hard and glossy is mixed in the proportions of hard asphalt (not flux), 10 parts, raw oil, 2 parts, and turpentine, 2 parts. The asphalt is first melted and then the oil is stirred into it, after which the turpentine is added. More turpentine may be added to thin the paint if necessary. The paint has also been found suitable for machinery such as road-grading and paving equipment that is exposed to the weather.

Clear Varnish Protects Ink Lettering on Celluloid

If it is necessary to change the lettering on celluloid index tabs, print the new lettering with ink, and, after it dries, give the tabs a coat of clear varnish. This makes a moisture-proof job and prevents the ink from being rubbed off. This idea is also adaptable to any job where writing with ink is done on celluloid.





Corners and Other Tight Places Are Cleaned Quickly with Brush in End of Broom Handle

Bottle Brush on End of Broom Handle for Cleaning Corners

With its shank inserted in a hole at the end of a broom handle, a stiff-bristled bottle brush will be found handy for sweeping out corners and for cleaning around machine bases where an ordinary broom cannot be used effectively. The brush will not interfere with the use of the broom, and is always at hand when needed.

Typing Copy to Make Clear Blueprints

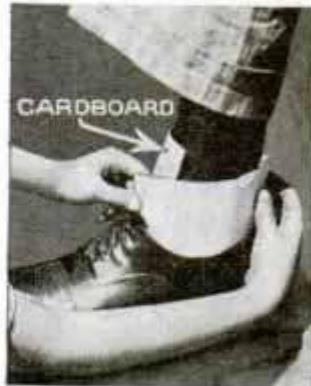
Here is a little trick that will be helpful in getting clear blueprints from typewritten matter such as architects' and engineers' specifications. When typing the copy, place a sheet of carbon paper behind the tracing paper with the carbon side next to the work so that the impression will be produced on both sides of the paper. This makes a dark type impression



that prints well on blueprint paper. For best results, use a black ribbon on the typewriter and type in capital letters.—L. C. Ferguson, Manteca, Calif.

Sock Shields for Bootblack

To protect his customers' socks while shining their shoes, one bootblack uses cardboard shields as shown. The shields are made in two pieces and slipped into the top of the shoe, one on each side, so that they meet at the front and overlap at the back.—E. K. Packer, Chicago.



Slide Sign Made from Old Curtain Rods

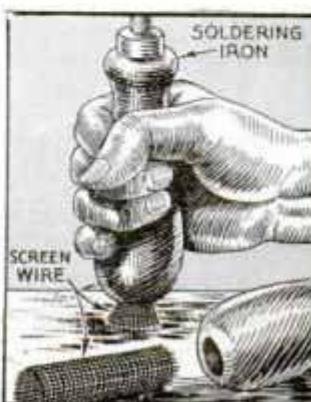
By cutting flat curtain rods lengthwise through the center and riveting the halves to a piece of tin or sheet metal, a neat holder is provided for sliding card signs.



When riveting the split rods to the metal, be sure that they are spaced correctly to take the cards. An ear projecting from the top edge of the metal backing serves as a hanger for the sign.—Lester P. Young, Culver, Ind.

Screen Wire in Handle of Soldering Iron for Scraping Work

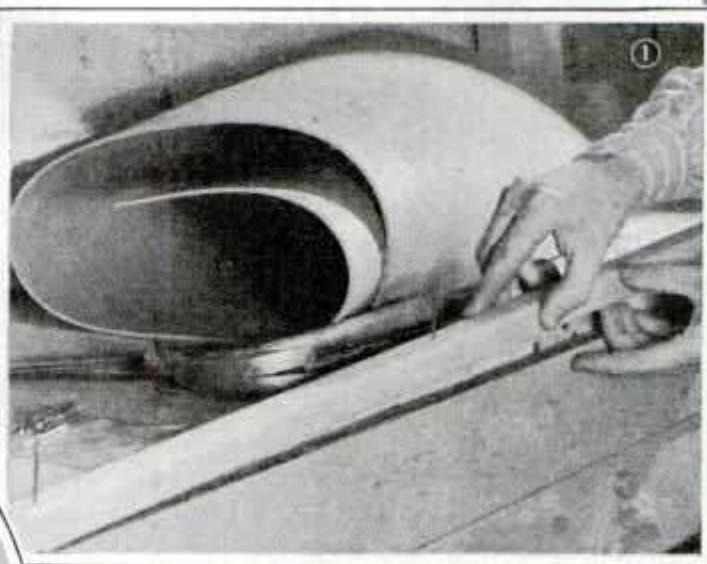
By drilling a hole in the end of a soldering-iron handle and fitting into it a small, compact roll of screen wire, an efficient scraper is always at hand for cleaning the work before soldering. When forced into the handle, the wire roll expands sufficiently to hold, yet it may be removed easily with a pair of pliers. The roll should project about $\frac{1}{4}$ in. beyond the handle.



Covering Tops of Workbenches with Rubber



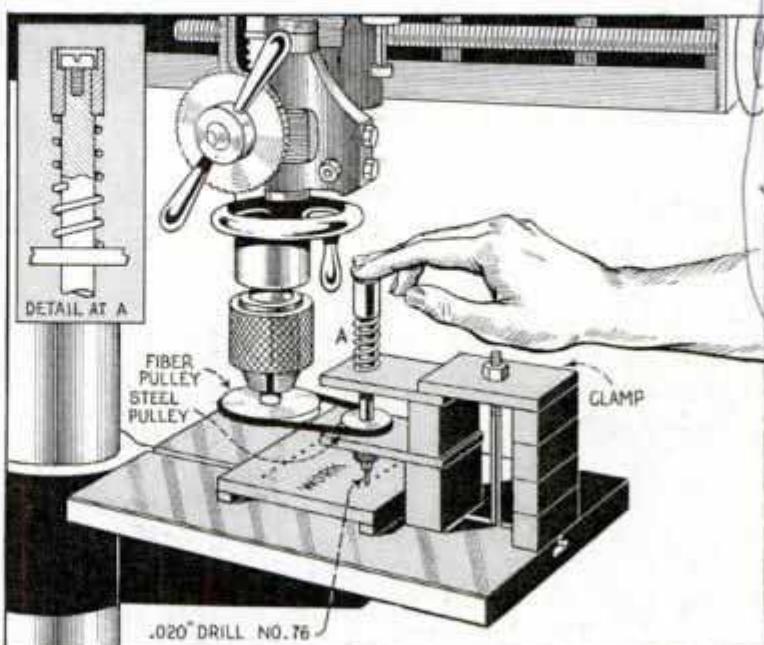
For covering tops of workbenches and tables in the shop, sheet rubber is a good



material to use. Flexible rubber flooring can be purchased for this purpose. To the edges of the surface to be covered, wood or metal strips are fastened to project above the table top a distance equal to the thickness of the covering, as shown in Fig. 1. The rubber is then cemented in place with waterproof linoleum cement spread in small ridges as shown in Fig. 2. A trowel having notches filed about $\frac{3}{16}$ in. deep in one edge makes a good tool for spreading the cement. After applying the rubber, it is rolled down with a roller as in Fig. 3.

Attachment for Drilling Small Holes in a Large Drill Press

In a shop where no small drill press was available, a job of drilling a number of small holes in $\frac{1}{2}$ -in. iron was done in a large drill press by using the attachment shown. This consisted of a slotted spindle, which was fitted with a small chuck and a sliding V-pulley, the latter being belted to a larger V-pulley chucked in the drill press by means of a short shaft. The spindle revolved in holes drilled through two flat pieces of steel, screwed to a spacing block of steel to keep the holes in alignment. A sensitive feed was obtained by using a light coil spring under a sleeve on the upper end of the spindle, as shown in the upper left-hand detail.



United States Rubber Co.
03. J. Goodrich Co.
Akron, Ohio

Simple Attachment Made from Scrap Parts Found around the Shop Adapts Large Drill Press for Using Small Pin Drills



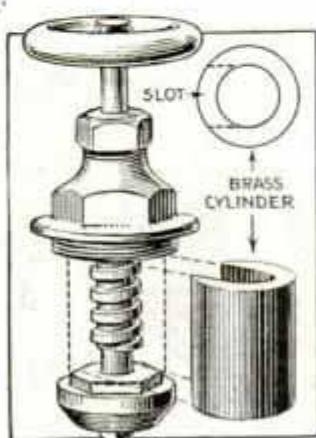
Made from an Old Wood Saw, This Ice Saw Is Mounted on Runners and Is Pushed by Two Men

Power Ice Saw Is Driven by Old Auto Motor

Powered by an old auto motor, which is set across on two runners, this ice saw is merely the mandrel, saw and metal framework of an old wood saw. The saw is pivoted at the ends of the runners so that it can be raised or lowered to cut at any depth, where it is held by a lever which can be locked at any adjustment. Sprocket wheels on the end of the mandrel and motor shaft take a chain for driving the saw, while handles bolted to the rear ends of the runners permit two men to push the machine over the ice.

Slotted Brass Sleeve Saves Time When Repairing Steam Valves

In shops where it is necessary to repair angle and globe valves, a short brass cylinder or tube slotted and slipped over the valve stem between the disk and bonnet as indicated by the dotted lines, will provide a means by which the valve assembly can be chucked in a lathe for turning down the disk so that it will seat correctly. The tube makes it unnecessary to remove the disk from the valve stem, and it is

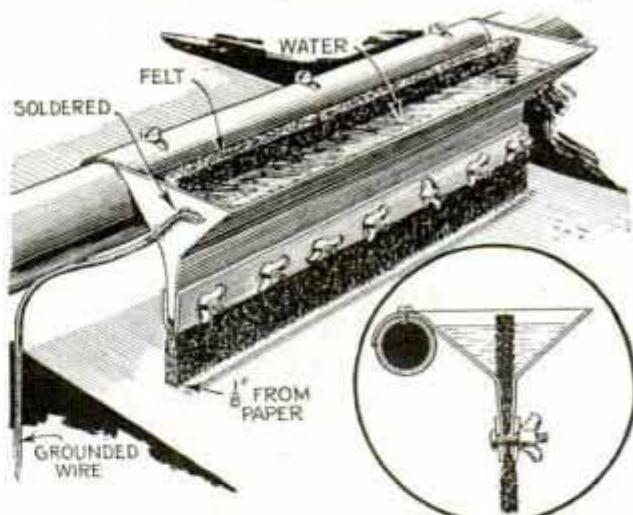


especially handy in shops where interstate commerce rules require monthly inspection and repairing of water-gauge valves and cocks.

Grounding Static Charge on Printing Presses

On the rotary presses in Popular Mechanics press room, the use of tinsel for grounding the static charge on the paper was found objectionable as the tinsel, dragging over the freshly printed surface, eventually

collected enough ink to cause a slight smearing. The improved substitute method shown in the drawing was tried and found successful. In this setup, the fine hairs of a strip of heavy felt, moistened with water, made very light contact with the paper without smearing it. The felt was held between the sides of a sheet-metal trough, which was fastened to a cross member of the press and was filled with water to keep the felt moist. To pre-

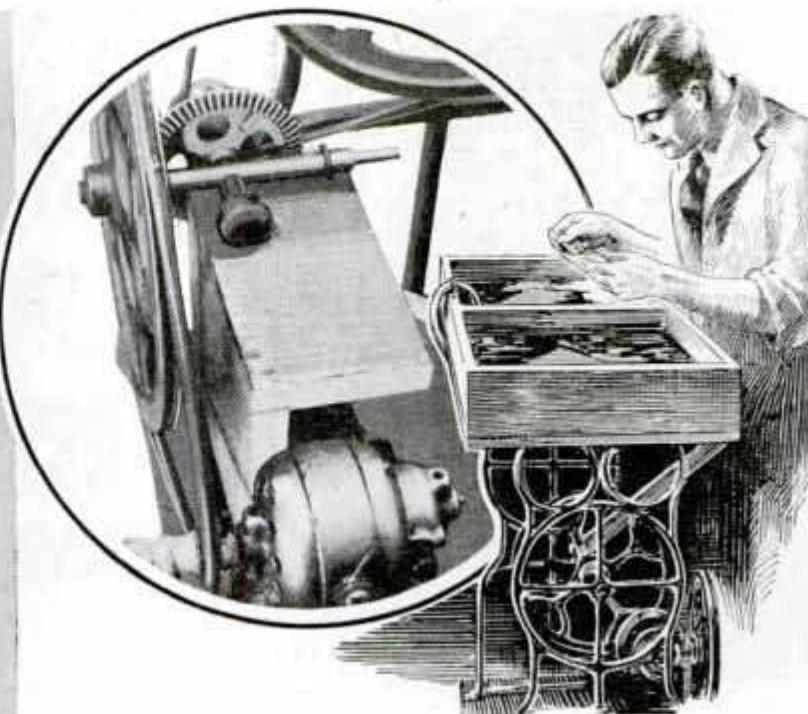
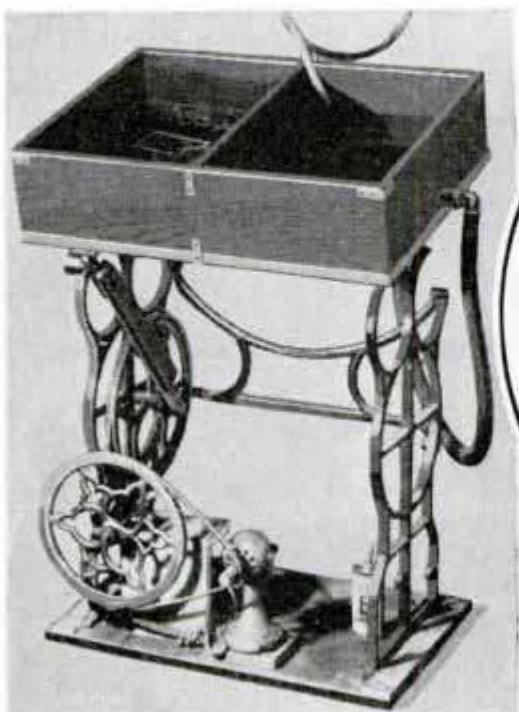


Water-Filled Trough Moistens Felt Which Collects Static Charge from Paper on Printing Press

vent too much water from seeping into the felt, the lower end of the trough was squeezed together with two strips of steel, adjustment being obtained by turning thumb nuts on screws spaced a few inches apart.—P. Hilger, Chicago.

Before painting window sash, rub a cloth soaked with kerosene over the glass.

Rocking Tank Washes Photographic Prints



Mounted on the treadle of an inverted sewing-machine chassis, this efficient photo-print washer can be made at practically no cost and will handle a fairly large volume of work. It is driven by an old electric-fan motor through the reduction gears of an old hand drill, the latter being belted to the treadle wheel, which imparts a rocking motion to the tank. To

adapt the drill to this purpose, an extra treadle wheel is substituted for the chuck and a small V-pulley is fastened to the large gear on the drill, after which the assembly is belted up as shown in the circular detail. The tank is made of $\frac{3}{4}$ -in. pine and the inside surface is coated with tar. Draining is done through a rubber hose slipped over a pipe nipple in one end.

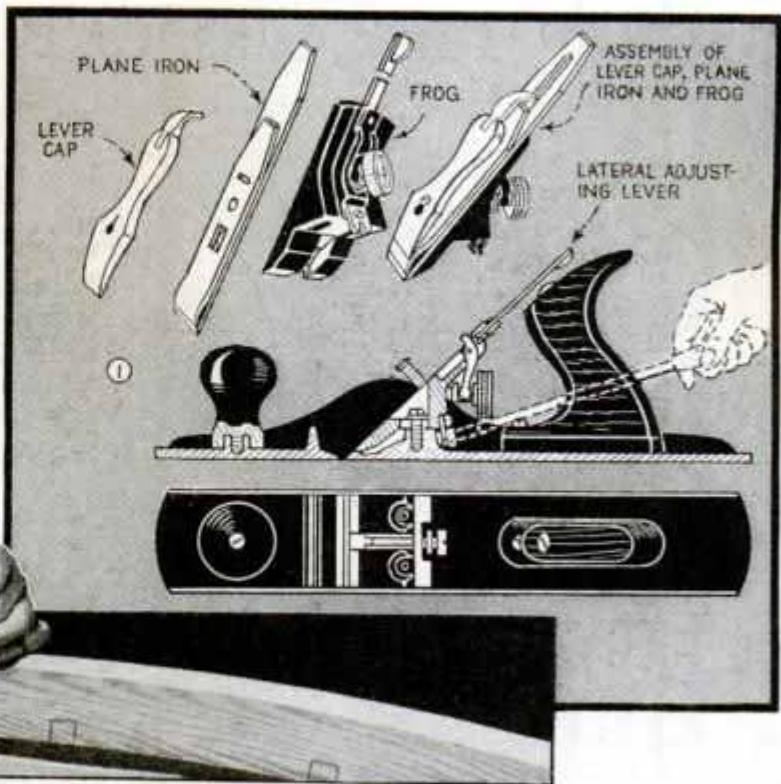
Wire Racks Display Fruit and Vegetables Sold in Barrels

A merchant who usually sold his fruits and vegetables from barrels displayed his products to his customers, after part of the contents were sold from the barrels, by using wire racks of the type shown in the detail. The racks were shaped from medium-gauge wire and have one vertical double loop in the center to hold the price tag and three horizontal loops on each side to hold samples of the fruit and vegetables. The racks were attached by forcing the ends between the upper hoop and staves.

Club holes that mar the appearance of castings but do not weaken them can be concealed with a mixture made by melting enough powdered graphite with sulphur to give it a metallic appearance. The mixture is molded into sticks and applied with a hot soldering iron.



Fruits and Vegetables Displayed on Edges of Barrels
by Means of Wire Racks



How to Use Your

TO obtain a smooth, true surface with a hand plane, the user must acquire the knack of handling the tool properly. Like all other hand tools, the correct manipulation of the plane is largely a matter of skill. Although the power jointer and thickness planer have largely supplanted the hand plane in production work, master carpenters, patternmakers and skilled joiners still rely on the hand tool for the smooth surfacing and close fitting required in highly specialized work. In the home workshop a set of hand planes is essential for good workmanship.

Parts of the common hand or bench planes are shown in Fig. 1. There are four kinds, namely, the "smooth" plane, "jack" plane, "fore" and "jointer" planes as in Fig. 4. The first is used principally in finishing off flat surfaces where there are slight uneven spots too high to be removed by sanding alone. The short length of the smooth plane permits working down the high places without planing off the entire surface. The jack and fore planes are the most commonly used of all, the former being a favorite with most users because of its light weight and general adaptability to a large part of the work ordinarily done

with a hand plane. The fore plane is simply a smaller model of the larger and heavier jointer plane and is used for the same purpose on short work. On any one of these planes either a corrugated or a smooth bottom can be furnished, according to the user's preference. The corrugated bottom is of some value when you are edging thin stock as it tends to hold the plane parallel to the stock.

In addition to these four types, there is a large selection available for use on special work. The wood-bottom plane, Fig. 3, is used mostly for rough outside work where removing stock is the first consideration and accuracy is not so essential. Every woodworker is familiar with the block plane, Fig. 10, of which there are many variations in size and type, most notable among which is the piano-maker's edge plane, Fig. 7, which is really a block plane with the cutter located at the extreme forward end. This tool is valuable in the tool kit as no other can be worked in such small space or so close into corners. Next, come the rabbet and matching planes, Figs. 5 and 6, the scraper plane and the curve, router and combination planes in Figs. 2, 7, 8 and 9. Several vari-



HAND PLANES

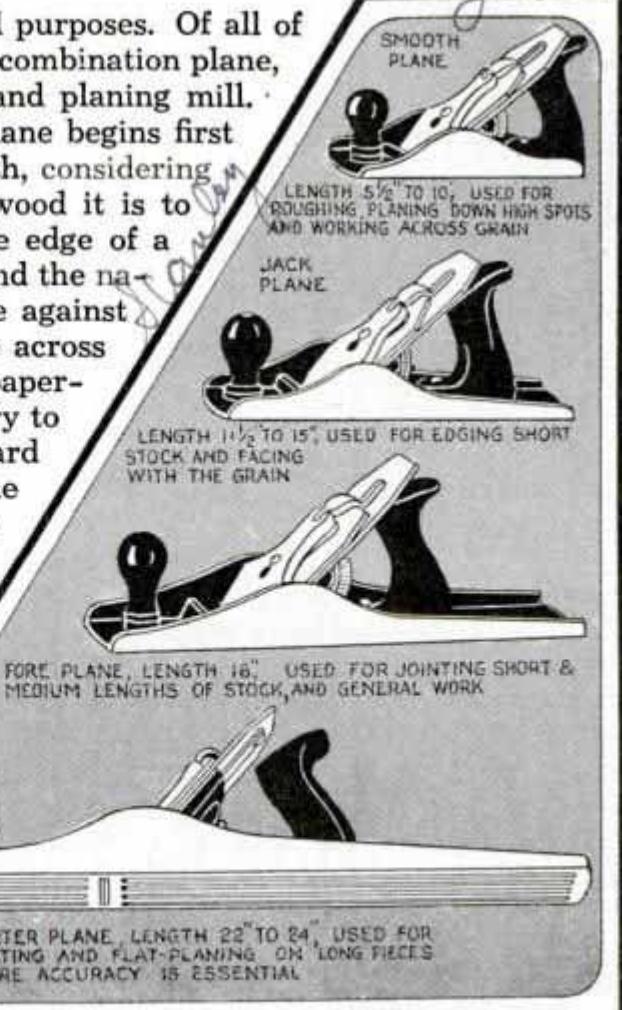
ations of each design are available for special purposes. Of all of these the most useful in the small shop is the combination plane, shown in Figs. 2 and 5, which is really a hand planing mill.

The secret of good work with any hand plane begins first with the correct setting of the cutter for depth, considering always the kind and characteristics of the wood it is to work in. If, for example, you must joint the edge of a piece of maple perpendicular with the face, and the nature of the work is such that you must plane against the grain, then the cutter must be set square across the throat and just deep enough to take off a paper-thin shaving. The same is true when necessary to plane through a knot while jointing either hard or soft wood. A similar setting of the plane iron is also made when the quality of the work demands as smooth a surface as is possible to produce. On the other hand, to remove surplus stock quickly on straight-grained material, the iron can be set to take a much heavier cut and still leave a smooth surface. The trick in planing a straight, true surface is to apply the pressure on the forward end of the plane with the left hand as if you were planing a concave surface. The tool should be run with the bottom parallel to the stock while the pressure and

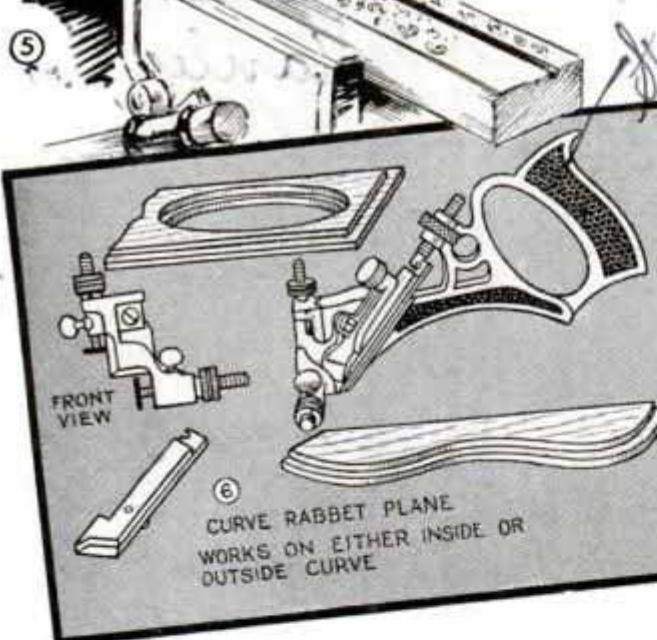
Stanley

Angle + Level 6

*All made by
Stanley Tool Works*

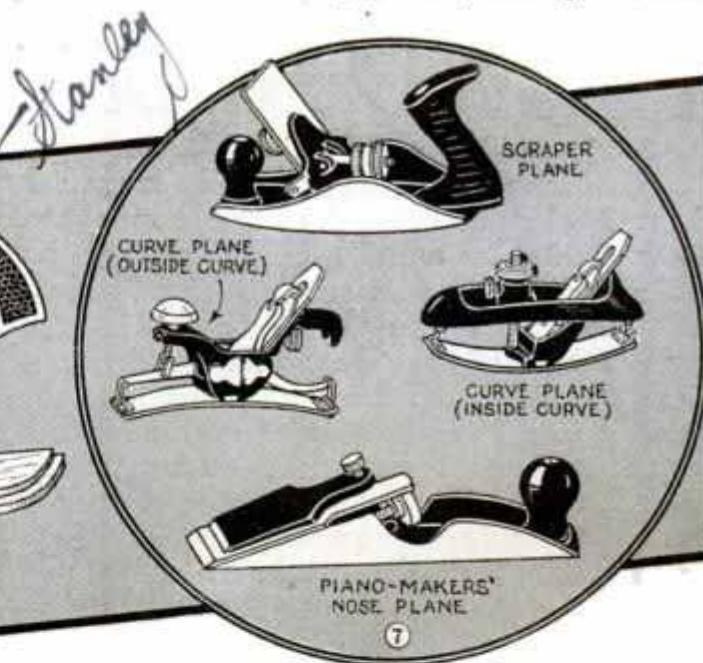


New Britain, Conn.



curved inward, take off the waste at the ends first, and then finish with one or two strokes the entire length. This should always be done with either the fore or jointer plane, cutting with the grain if possible. To reduce the thickness of material, first make sure that the edge of the plane iron is ground square across and honed razor-sharp. Use either the jack or smooth plane after having set the cutter to take a very light shaving. When planing on a flat surface with the full width of the cutter taking off the shaving, it is best to run the plane at a slight angle to the forward direction, as this position gives a shearing cut.

When you glue up a number of narrow pieces to make a single, wide panel, it will be necessary to finish the slight irregularities at the glue joints. Clamp the panel to a bench top and remove the hardened glue from the joints, then plane first across the grain with the jack plane to remove the high spots, and finish with the jointer plane running with the grain. When you must plane end grain on wide stock or plywood, clamp a small



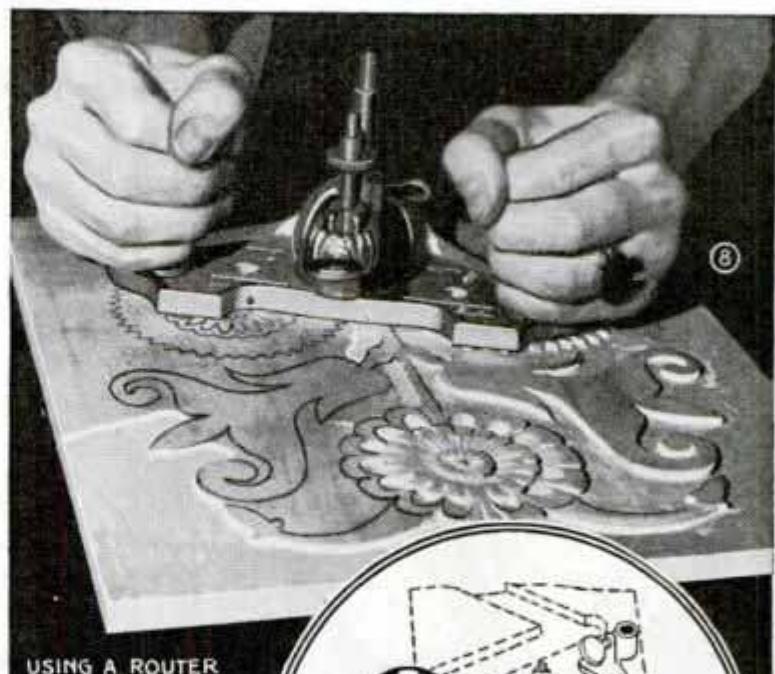
force are applied to the tool with a combination of arm and body movement. This method avoids the tendency to round over at the ends of the stock, which is likely to result if you hold the plane at an angle to the stock or if you are apt to apply pressure with the right hand.

To straighten the edge of a piece of stock that is rounded, begin planing with short strokes at the center, increasing the length of each stroke until the edge is straight throughout the length. Conversely, to true an edge that is concave or

block flush with the edge opposite that at which the cut is started. This will prevent splintering the wood at the finish of the planing stroke. While the block plane, shown in Fig. 10, is especially suited to end-grain work, due to the greater angle of the cutting edge, any other type of plane may be used if the cutter is set to take off a light shaving.

The one important adjustment on the combination plane when making any cut is the proper setting of the cutter for depth. On a piece of work that requires

accuracy and a smooth finish, it is best to test the setting of the tool on a piece of waste, more particularly if you are working in hardwood. The cutter must always be as sharp as painstaking honing can make it. It is equally important to keep the spurs sharp as these check the wood ahead of the cutting edge so that the shaving is lifted off without splintering. Clean molding is produced only by taking off a paper-thin shaving at each stroke. These planes are supplied regularly with as many as fifty-five separate cutters, and the construction provides all adjustments necessary in using any one of them. In addition, blank cutters are obtainable, which you can grind to any shape you may require.



USING A ROUTER PLANE TO RECESS A FLAT SURFACE

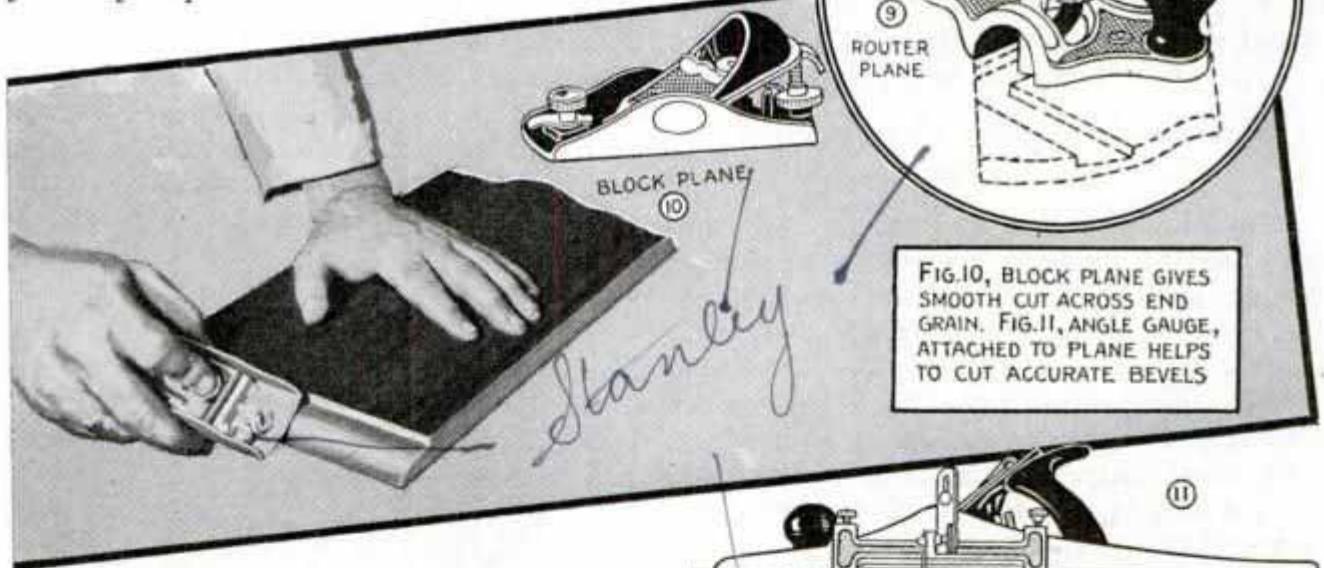
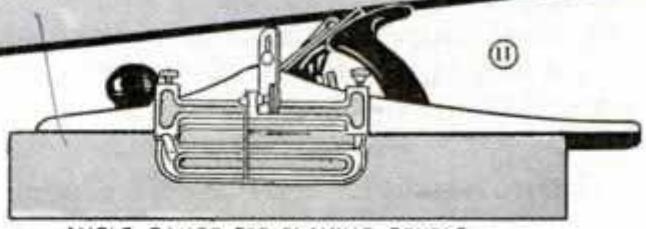


FIG.10, BLOCK PLANE GIVES SMOOTH CUT ACROSS END GRAIN. FIG.11, ANGLE GAUGE, ATTACHED TO PLANE HELPS TO CUT ACCURATE BEVELS

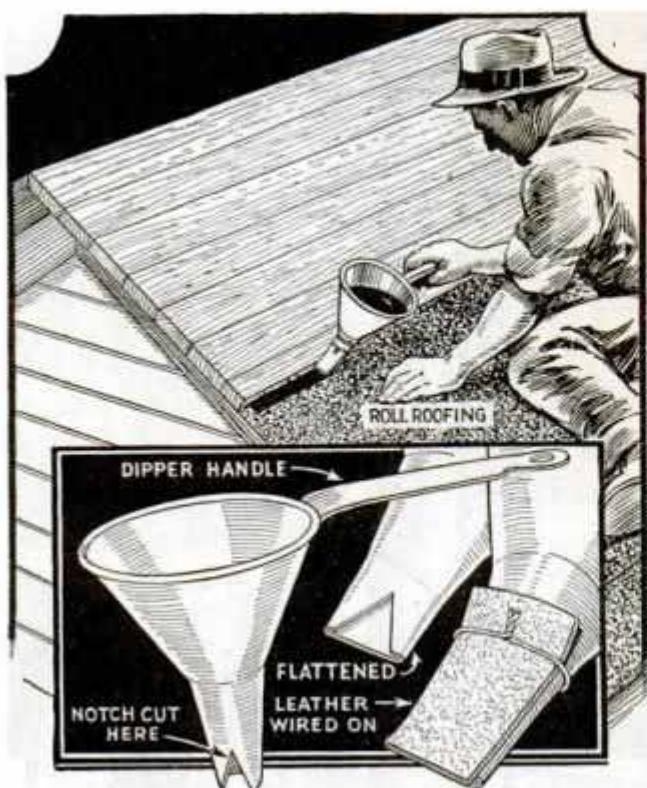
Acid-Proof Cements for Repairing Glass and Stoneware

For repairing glass and stoneware acid containers, the following cements can be made from materials readily obtainable: A strong cement that sets very rapidly is made by working water glass to a paste with ground glass. Boiled linseed oil worked to a paste with quicklime is also effective. A more complicated cement of the same type is made by mixing rosin, 12 lbs., red ocher, 4 lbs., plaster of paris, 2 lbs., and boiled linseed oil, 1 lb. The ingredients are mixed while heating until the rosin has melted and the cement is of even consistency. When heating the mixture, care should be taken to prevent the



ANGLE GAUGE FOR PLANING BEVELS

oil and rosin from igniting. Equal parts of white lead and China clay worked to a paste with boiled linseed oil make another excellent product. Equal parts of pitch and rosin melted together and thickened with plaster of paris also form a durable cement. The plaster must be added slowly while stirring to produce an even mixture. The hardest cement of all, and, for many purposes, the most effective, is made by melting equal parts of sulphur and rosin and thickening the molten mass with an equal quantity of brick dust. Sulphur burns readily and should be melted with care.



With This Spreader Cement Is Neatly Applied to Lapped Edges of Roll Roofing

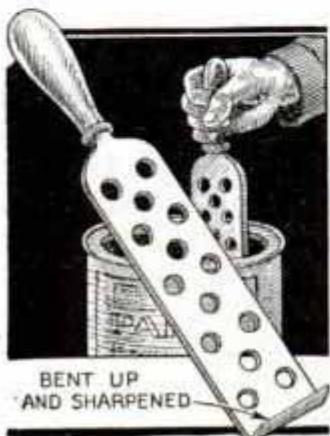
Spreader for Roofing Cement Made from a Funnel

When laying roll roofing, much time can be saved by using this spreader to apply cement on the lapped edges of the roofing strips. It consists of a funnel, provided with a handle and a leather flap for controlling the flow of cement from the spout. The flap, fastened to the spout with wire, projects slightly. In this position, pressure on the flap as it is drawn along the seam controls the flow of cement.

Improvement for the Paint Paddle

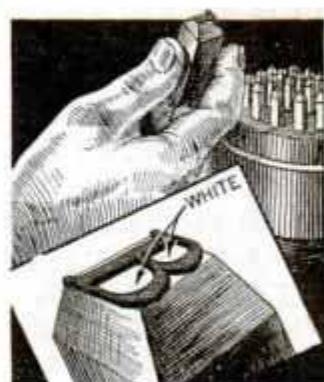
Whether your metal paint-stirring paddle is of the manufactured or homemade variety, its usefulness can be increased if the lower end is bent over at right angles and sharpened. This will make it easy to scrape loose the pigment that settles at the bottom.

Also, the bent end provides a flat surface handy for mashing lumps already loosened.



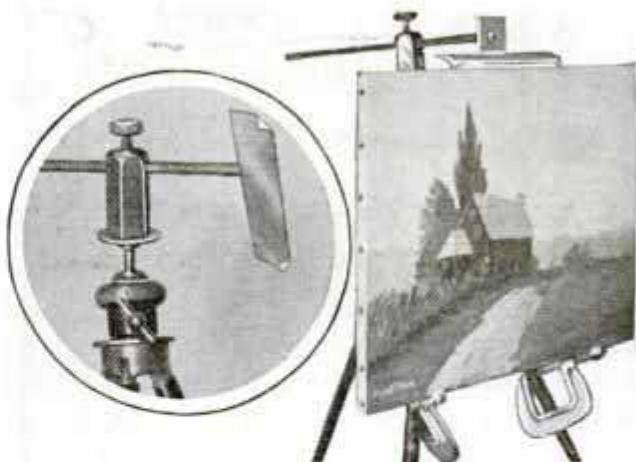
White Background on Steel Stamps Aids in Selecting Them

By applying white paint to the background around the face of steel stamps, the raised portion or letter will be easier to see, which aids when selecting them. The paint is brushed over the face of the stamp, after which it is wiped off the raised portion.—Thos. Trail, Baltimore, Md.



Camera Tripod Used as Portable Sketching Easel

An ordinary camera tripod fitted with an Octipod is the basic part of this portable sketching easel, which is adjustable to accommodate various widths of work. A head, which screws to the Octipod, is made of round or hexagon brass and is drilled and tapped at the upper end for a thumbscrew to hold a small iron rod in a horizontal hole through the head. This rod carries a bar at one end to support the sketching board vertically, while a couple of C-clamps on two of the tripod legs sup-

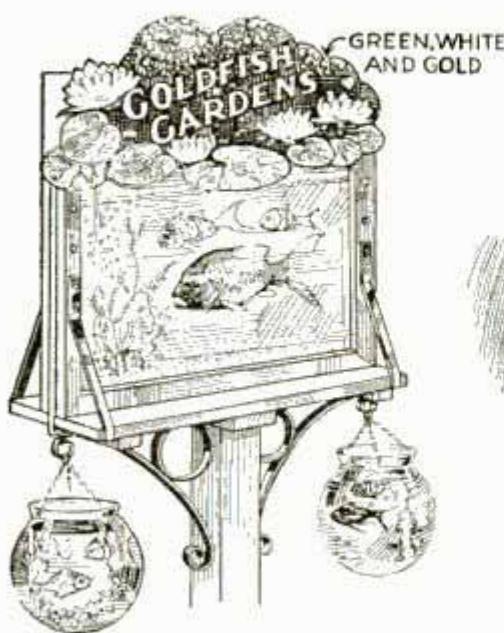


Fitted with a Homemade Head, a Camera Tripod Is Used as an Adjustable Sketching Easel

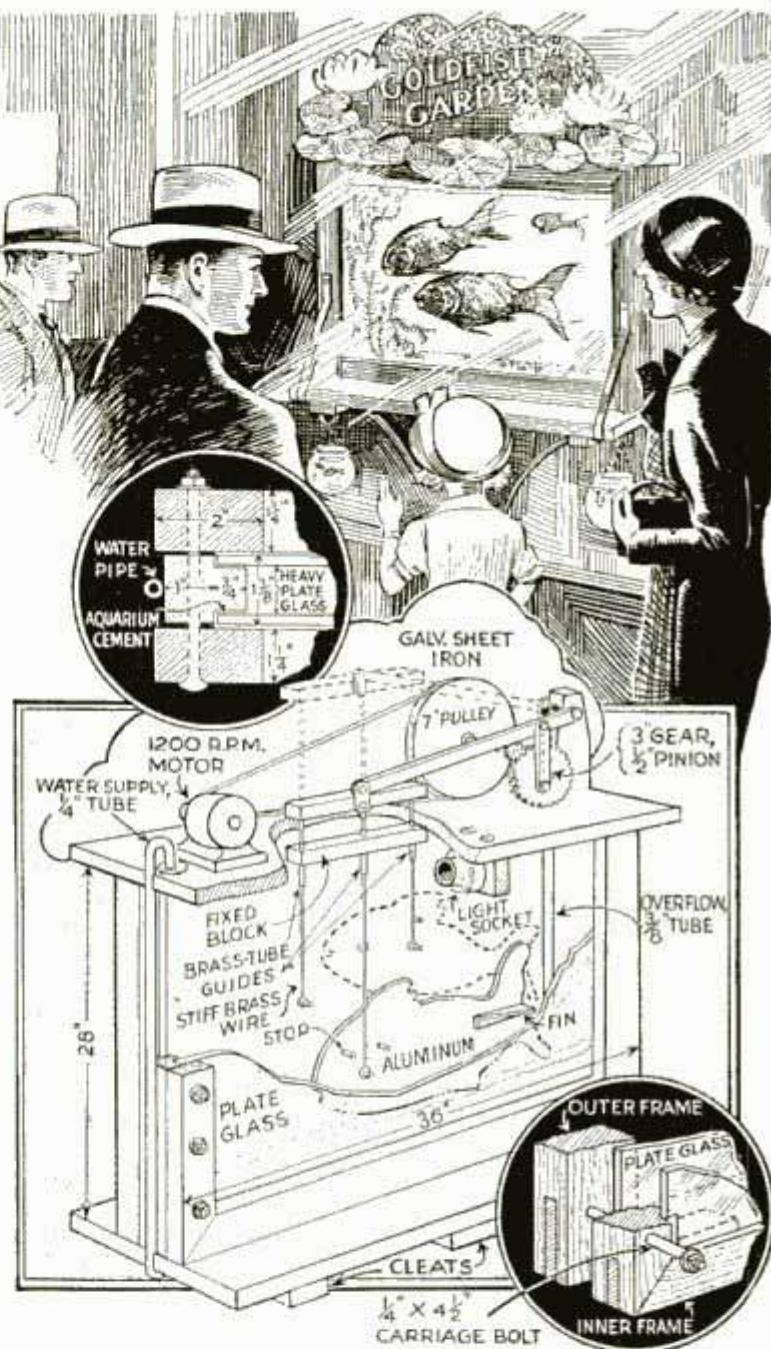
port it horizontally. The tripod can be used for a camera by simply removing the Octipod and the C-clamps.

Tampering with screws can be prevented by dropping a little solder on the head of the screw to fill the slot.

Mechanical Goldfish Display Draws Trade

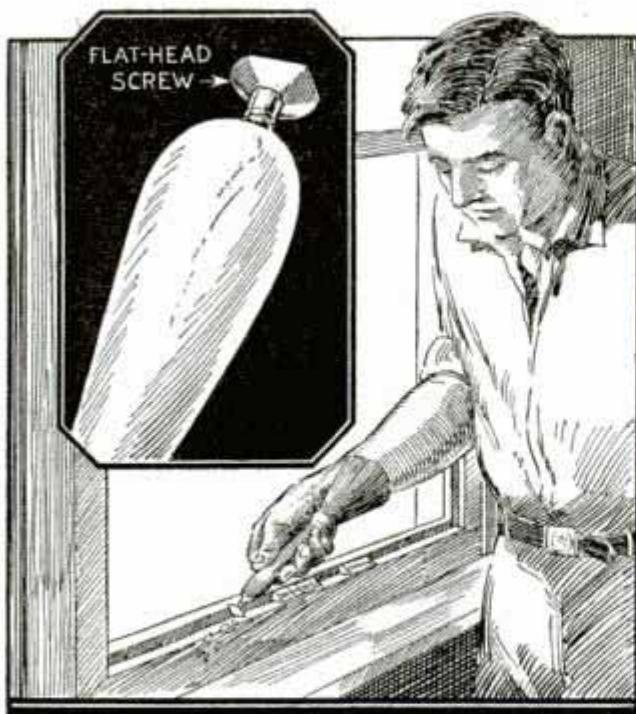


Attention of passersby is promptly arrested by these gigantic goldfish swimming lazily in an aquarium filled with water. The aquarium is built specially for the display and is only $1\frac{1}{4}$ in. wide. The fish, cut out of sheet aluminum, move up and down freely in this narrow space, being actuated by a simple mechanism, which is driven by a small motor. In making the aquarium, the corners of the frame are mortised and marine glue is used. Note that there is a slight clearance between the center and outer frame members when the glass panes are in place, making it possible to draw the joints tight by means of bolts. Aquarium cement is used in the rabbet between the glass and the center frame member. The speed of the mechanism should be such that the three fish rise and sink about ten or twelve times per minute. In length, the three fish should measure 15, 9 and 6 in. Fins are attached to each side of the tails so that the heads will tilt in the direction the fish are supposed to be swimming. They pivot on a pin soldered to the back, and stops keep the fish from tilting too far. The brass wire used to suspend the fish should be heavy enough to resist lateral pressure from the moving fish, caused by action of the tail fins in the water. For illumination,



a couple of electric bulbs hidden under a sheet-metal lily pad on the aquarium, give a good effect. If you have the fish covered with real gold leaf by an expert, the effect will be startling. Glass bowls containing real fish can be swung from iron brackets below the large aquarium.

If asbestos gaskets used around hand-hole plates in boilers are soaked in distillate before putting them in place, they will soften and make a tight seal when the bolts holding the plate are drawn down; heat from the boiler quickly evaporates the distillate.



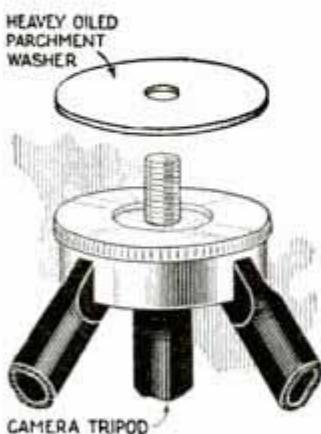
Old Putty Removed from Sash with Tool Made by Driving Screw into Glaziers' Brush Handle

Screw in Brush Handle Aids Glaziers

Driven into the handle end of a glaziers' brush, a flat-head screw with one side of the head filed to a sharp angle as shown provides a good tool for removing old putty from broken windows. The screw head is merely pushed along the sash groove where it will chip away the hard, dry putty without cutting into the wood.

Parchment-Paper Washer Keeps Tripod from Marring Camera

If you have a small metal-top tripod and it scratches the bottom of your camera, this trouble can be prevented by slipping over the tripod screw, a washer cut from heavy, oiled parchment paper. The hole in the washer should be a tight fit over the screw to prevent it from falling off when carrying the tripod.—H. M. Holmes, Pasadena, Calif.



Use of a lathe bed as a substitute for an anvil on small jobs quickly destroys its accuracy.

Celluloid Helps Prevent Wrinkles in Tracing Paper

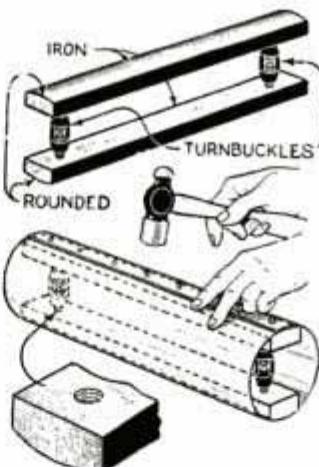
To prevent moisture in the fingers from wrinkling a sheet of tracing paper and also to avoid soiling the paper while lettering it, rest the hand on a piece of clear celluloid, which has been slotted as shown. A piece of photographic film is handy for this if the emulsion is removed with a solution of water and washing soda.—Gerald A. Boate, Seattle, Wash.



Adjustable Anvil for Riveting Seams of Sheet-Metal Pipe

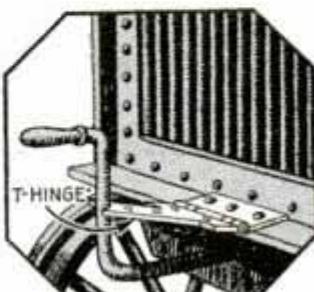
When various sizes of galvanized-iron pipe must be made on a job away from the shop, sheet-metal workers will find this adjustable anvil helpful in riveting the seams. The anvil consists of two 1-in. iron bars 2 in.

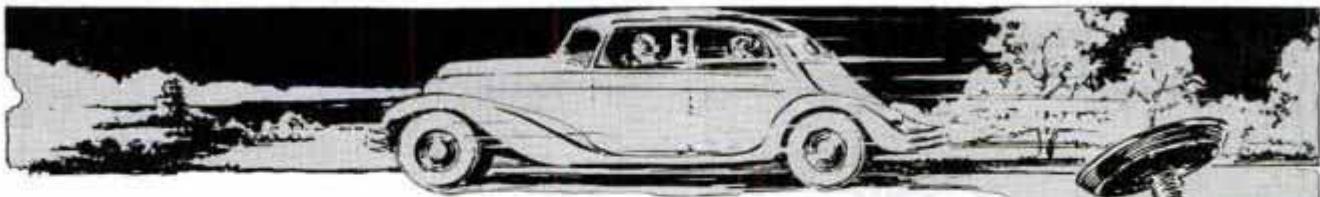
wide and a couple of strong, stub-end turnbuckles. The bars are rounded on one side and then drilled near the ends to take the ends of the turnbuckles, which are threaded.



Tractor Crank Held Up with T Hinge

Fastened to the front of a tractor, a T-hinge serves as a support for holding up the crank so that it will not get bent when the machine is used for rough work. The short half of the hinge is fastened to the radiator support and the other end is cut to fit around the crank.—G. W. White, Severn Park, Ont., Can.



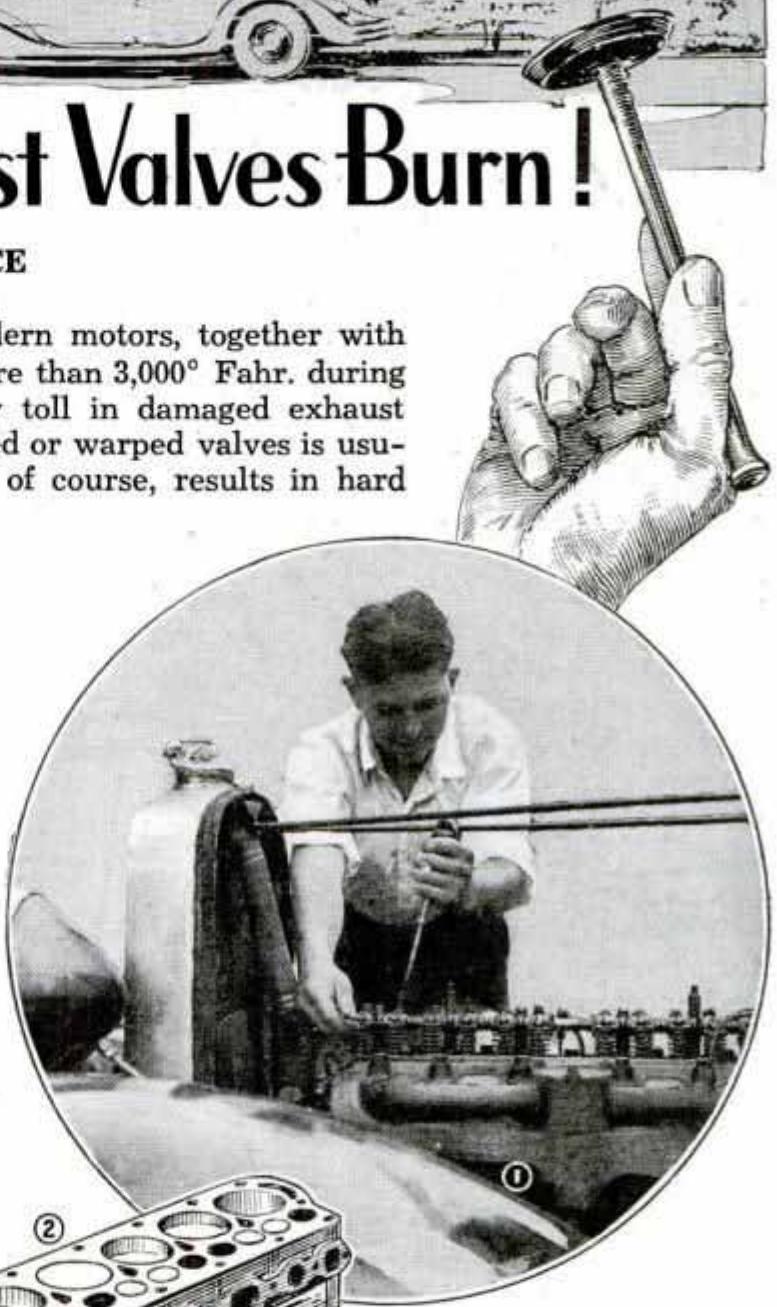


When Exhaust Valves Burn!

By A. H. VANCE

HIGH compression ratios of modern motors, together with the terrific heat generated, more than 3,000° Fahr. during the explosion stroke, take a heavy toll in damaged exhaust valves. The first indication of burned or warped valves is usually a loss of compression, which, of course, results in hard starting, loss of power and uneven running. Replacing the damaged valves with new ones is only a temporary cure unless the actual cause of burning has been remedied. There is only one reason for a burned valve, and that is failure to cool properly. Unlike the intake valves, which are cooled by the incoming gases, the exhaust valves have no way of cooling except by contact of the heads with their seats or by contact of the stems with the valve guides.

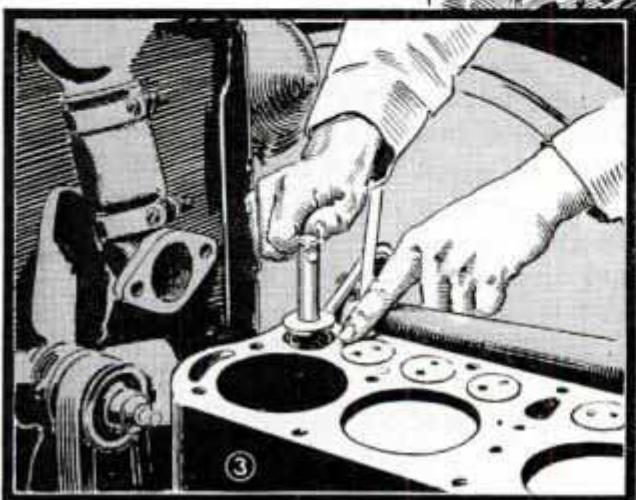
Tight valve tappets, set too closely in an effort to eliminate noise, often prevent the valves from seating properly and result in burning. Setting the tappets, Fig. 4, to exact specifications and under the exact condition as recommended by the car manufacturer will prevent much trouble.

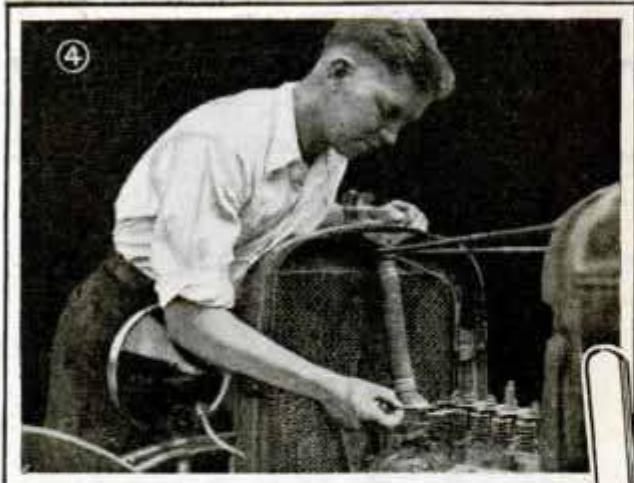


With the motor heated to its maximum temperature and running slowly, the tappets can be checked for clearance as in Fig. 1.

A thickness gauge, Fig. 5, is used for this purpose. If you are unable to determine which are the exhaust valves, their positions on most six-cylinder motors are shown in black in Fig. 2. Another way of telling which are exhaust valves, is to examine the exhaust ports and see which valves open into them.

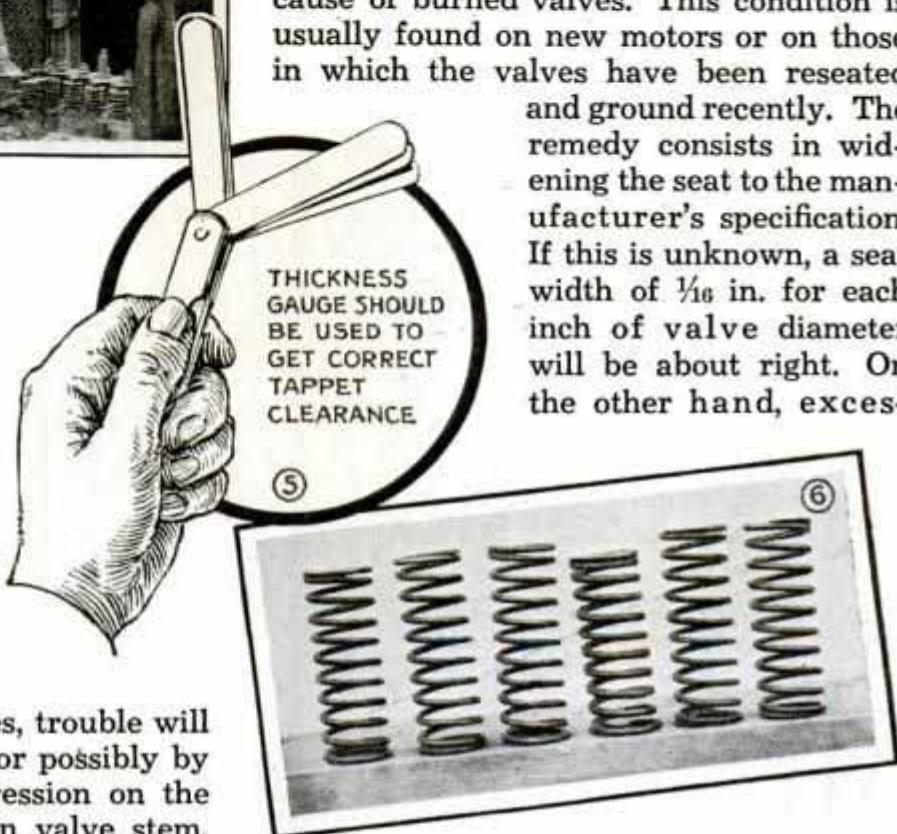
Once overheated, a valve may warp and prevent proper contact of the head with its seat. This condition is often indicated





by an excessively loose tappet which is heard immediately after the motor has been driven hard. Bent valve stems, sometimes due to overheating, but often caused by the substitution of valve springs, or by actual damage with the improper use of a valve-spring lifter, also prevent the proper seating of the valves and interfere with their cooling. In these cases, trouble will be indicated by a lack of, or possibly by a complete loss of, compression on the cylinders affected. A worn valve stem, or a worn guide will often prevent heat from an exhaust valve passing away to the cylinders. At the same time, the valve head may be cocked on its seat for a short period of time after it should have been closed, preventing the proper contact at this point. Worn valve guides always interfere with proper running in other ways and should be replaced without delay. The amount of play is easily determined by shaking the valve in the guide after the spring has been removed. The wear may also be considered excessive if shoulders can be seen on the stems.

A sticking valve stem, which may be indicated by fine scores on the stem near the head, or by evidence of the lack of a free fit when the valve is removed, will prevent proper seating and may be the cause of burning. This can be determined easily by examination when removing the valves. Scraping the carbon from the stem and polishing it with a piece of fine emery cloth



will generally remedy this trouble. It is a good idea to wash the valve in gasoline to remove all emery particles before replacing it. When cleaning a valve stem, always give it a bright, smooth finish with fine emery cloth to avoid grooves which permit rapid accumulation of carbon. Excessively narrow valve seats lessen the cooling possibilities and are a frequent cause of burned valves. This condition is usually found on new motors or on those in which the valves have been reseated and ground recently. The remedy consists in widening the seat to the manufacturer's specification. If this is unknown, a seat width of $\frac{1}{16}$ in. for each inch of valve diameter will be about right. On the other hand, exces-

sively wide seats sometimes allow space for the accumulation of carbon on the valves or the seats, thus holding the valves off the seats at other points and permitting them to burn. If trouble is had from this source, the remedy consists of reducing the width of the seat with a cutter designed for this purpose as shown in Fig. 3.

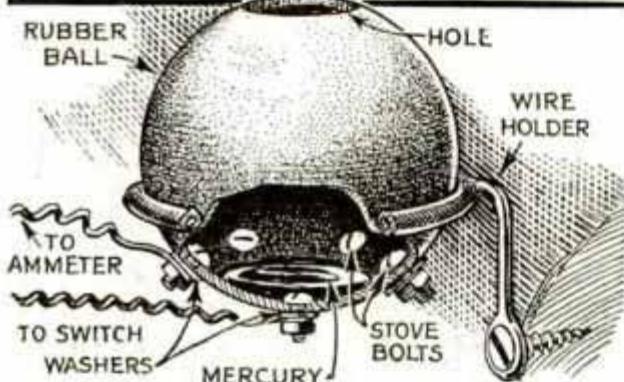
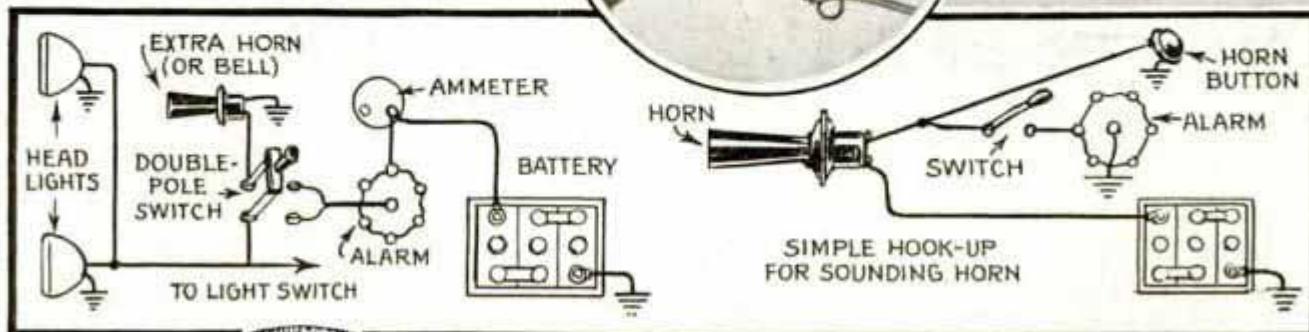
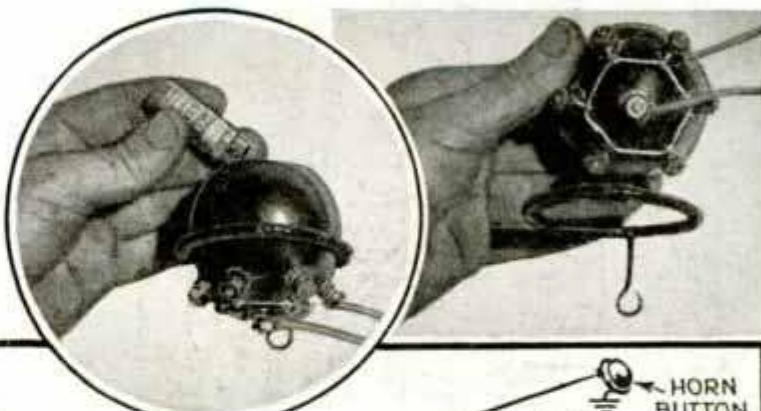
Weak valve springs on one or more exhaust valves may slow the valve action to such an extent that burning will occur. However, a weak spring will cause an excessive tappet noise at high motor speed. Valve springs should be checked against each other by comparing their height when set on a smooth surface as in Fig. 6. The short springs should be replaced at that time with new ones.

When replacing driveshafts in late-model cars be sure that the arrow marks on the shafts and the universal joints align.



Homemade Car Alarm Sounds Horn or Bell

Mounted on the instrument panel or above the windshield, this sensitive alarm sounds a bell or horn and flashes the headlights when the car is jolted or moved. It consists of a hollow rubber ball containing some mercury the level of which is just a trifle below a

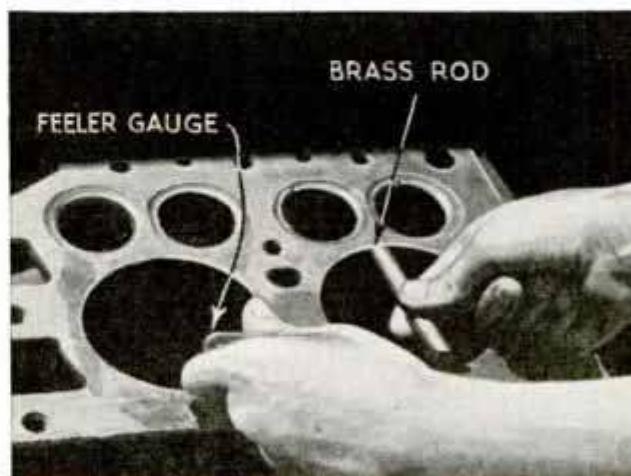


row of stove bolts passing through the side of the ball. This arrangement forms a switch, one lead being connected to all of

these bolts and another to a single bolt which projects into the mercury. A jar causes the mercury to move against any one of the connected bolts thereby closing the circuit which sounds the alarm. The sensitivity depends on the space between the bolts and the mercury. The ball is set in a wire frame and can be adjusted so that the mercury will just clear the bolts no matter at what angle the car is parked. Then, after getting out of the car a double-pole switch is thrown to connect the alarm circuit, which, of course, is disconnected when the car is in use.

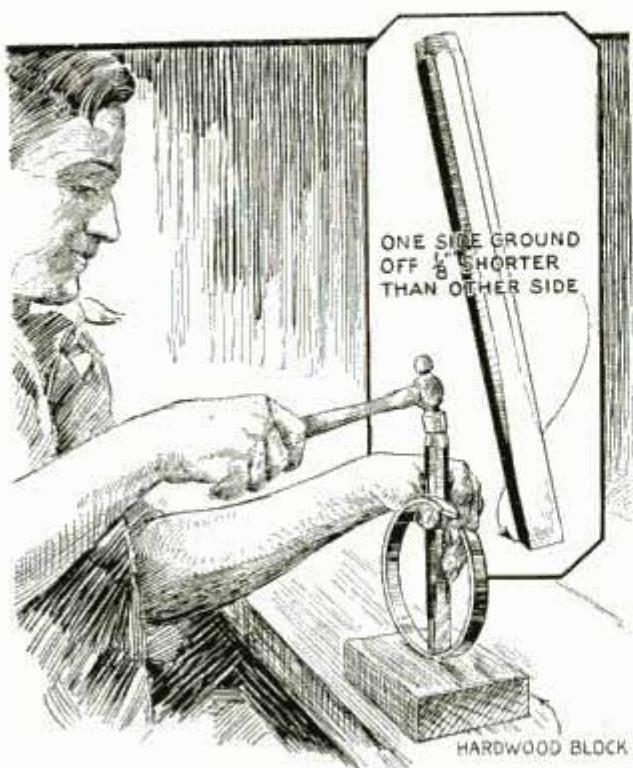
Rod Used to Gauge Amount of Wear in Cylinder Walls

When installing oversize pistons, it is necessary to know the amount of wear in the cylinder walls if a satisfactory job is to be done. As dial gauges, which are generally used to measure the cylinders, are expensive, the car owner who does his own work may use a brass rod as a substitute. This is ground to fit the cylinder horizontally at the bottom where the wear is the least, after which the rod is placed inside the cylinder at the upper end, using a feeler or thickness gauge between the rod and the cylinder wall to determine the amount of wear. It is, of course, necessary to remove the ring or unworn portion of the cylinder wall at the top of the piston travel before fitting oversize pistons.



Length of Brass Rod Used as Substitute for Dial Gauge in Measuring Wear of Cylinder Walls to Install Oversize Pistons

Renewing Old Piston Rings

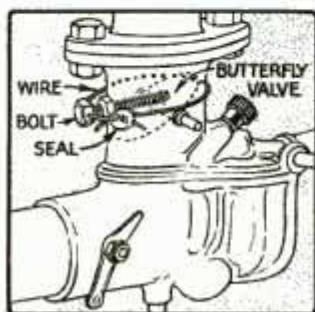


Nicking Inside Surface of Old Piston Rings Increases Tension against Cylinder Walls

In some cases where the condition of a car does not warrant installing new piston rings, life of the old ones can be renewed somewhat by nicking their inside surfaces with a cold chisel. This spreads slightly the gap in each ring and increases its tension against the cylinder wall. The edge of the chisel used for this purpose is ground so that one side is $\frac{1}{8}$ in. shorter than the other, and it is beveled at about 75° instead of the customary 90° . The series of nicks should be spaced about $\frac{1}{4}$ in. apart and extend 2 or 3 in. from each side of the starting point, which should be opposite the gap in the ring.

Inexpensive Speed Regulator for Trucks

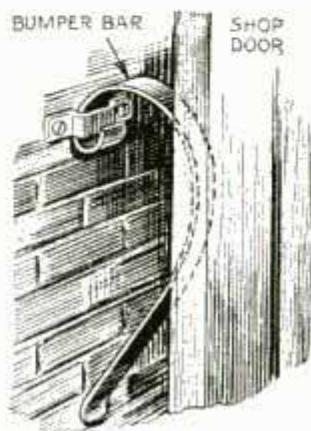
Owners of truck or tractor fleets who desire low-cost speed regulators to prevent the operators from driving the machines at full speed will find the illustrated method effective. The carburetor is drilled and tapped about $\frac{1}{4}$ in. above the butterfly valve for



a small bolt, which checks the travel of the valve. After setting the bolt to permit the desired opening of the valve, a lock nut is driven on to hold it and the adjustment is protected with a wire seal.

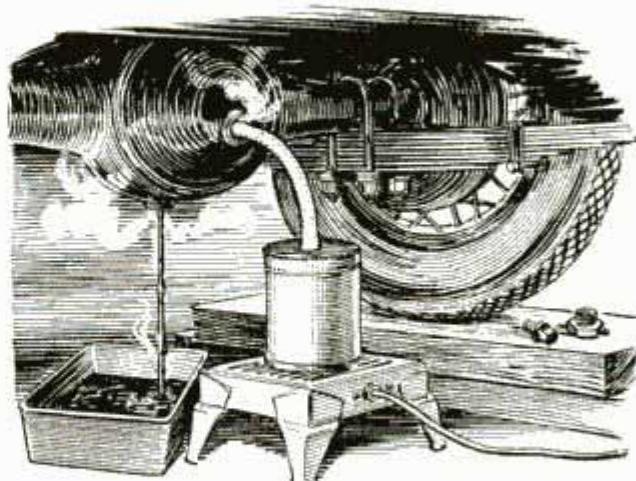
Bumper Bar Attached to Wall Serves as Door Stop

To avoid damage resulting from a heavy, swinging garage door striking the wall when it is opened, a spring stop can be made from a bumperette bar. This is mounted on the wall as shown, to take the impact of the door. The lower end of the stop hangs free to permit a springing action when the door strikes.



Improvised Boiler for Steam Flushing Transmission and Differential

With this boiler improvised from a can having a tight-fitting lid, the car owner who likes to do his own work can duplicate the job done by service stations where steam or hot air is used to flush transmission and differential housings. The steam is directed into the housings with a rubber tube, which is fitted tightly into a hole



Steam Melts Old Grease and Flushes Foreign Matter from Transmission and Differential Housings

in the can lid. It is best to heat the water in the boiler with an electric hot plate as a flame under the car is a fire hazard.

Clutch Facing Held in Place with Strings

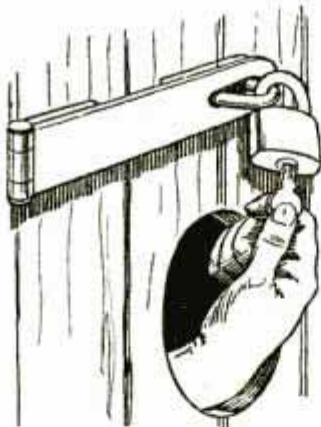
When replacing clutch disks that are not riveted to the clutch plate, tie the disks together with string as shown. This will prevent them from falling between the plate and pressure plate. With this method, it will be necessary to leave the strings tied to the clutch facing, but they will do no harm.—James W. Clift, Columbus, O.



prevent them from falling between the plate and pressure plate. With this method, it will be necessary to leave the strings tied to the clutch facing, but they will do no harm.—James W. Clift, Columbus, O.

Hand Hole in Door Permits Locking Garage from Either Side

If your garage faces an alley and the doors are locked from the inside, you can save many steps by cutting a hand hole in one of the doors so that they can be unlocked from either side. The hole should be made directly under the lock and should be just large enough to take the hand. This will not permit a burglar to manipulate any tools to open or break the lock.



Preventing Squeaky Windshields



Squeaks that originate from the rubber seal around a windshield can be eliminated by applying a mixture of vaseline and powdered graphite to the rubber. A soft cloth may be used to apply the mixture, which should be used sparingly. If too much is applied, it will catch dust and give the windshield an unsightly look.

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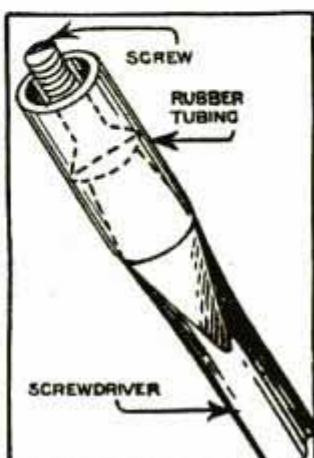
Master Cylinder of Hydraulic-Brake System Filled by Means of Rubber Tube and Funnel

Easy Method of Filling Master Cylinder of Hydraulic-Brake System

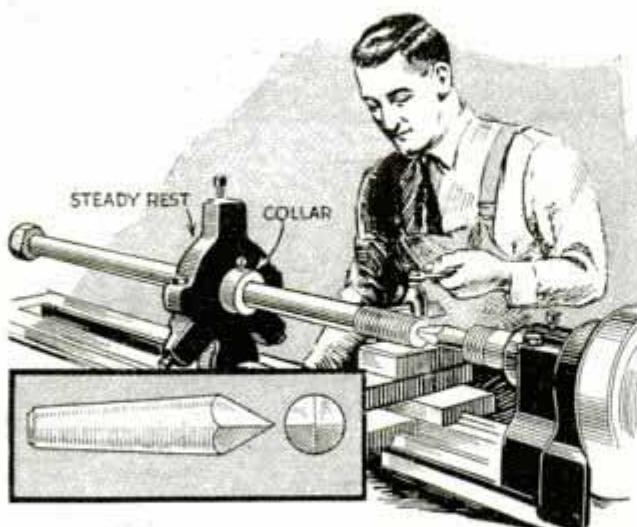
When the master cylinder of a hydraulic-brake system is located on the underneath side of the car, it can often be filled by means of a funnel and a length of rubber tubing, which is inserted through the opening in the floor boards above the battery. The funnel for this purpose is an oil can with the bottom removed and the spout inserted into the tubing.

Rubber Tubing Serves as Screw Holder on Screwdriver

When replacing a crankcase on cars that have it attached with machine screws, time can be saved by using a holder on the screwdriver to assist in starting the screws that are hard to reach with the hands. For this purpose, a satisfactory holder may be had by slipping a short section of rubber tubing over the end of the screwdriver blade to hold the screw.



Set-Up for Rethreading Long Bolts in a Small Lathe



Emergency Set-Up for Rethreading Large Bolts in a Small Lathe Where Centers Could Not Be Used

On a job where six bolts 9 ft. long and 2 in. in diameter had to have the threads

cut a little deeper and the only lathe available was too short to take them between centers, the work was done with the set-up shown. An old, damaged live center was ground to form a spur center, after which the tailstock was removed and the work supported by a steady rest. As the bolt had center holes at the ends and was fairly soft, a light hammer blow on the head drove the center into the end sufficiently to turn the work for taking a light cut. A collar fitted with a set screw and slipped over the bolt to bear against the steady rest, held the end of the bolt against the lathe center.—Charles Kugler, Philadelphia, Pa.

Oil paint has a tendency to wrinkle up on exposure to extreme cold but this may be prevented by the addition of a little turpentine.

The Next Issue

"VANJA"—FAST, CLASS-A, MODEL RACING YACHT

In July, 1933, "Vanja," designed by George Baron of Chicago, was awarded first place in the United States National Championship Race at Port Washington, Long Island. It then became the U. S. challenger in the International Championship Races at Fleetwood, England, held in August of the same year.

CORRECT MEASUREMENTS—Key to Fine Workmanship

Good craftsmen know the value of accurate measurements when making anything of wood or metal. This story tells how to eliminate all guesswork.

THE LATEST IN FOLDING SCREENS

No doubt you have seen the latest shutter-type of folding screens that permit passage of air and light. Making them is only a matter of correct procedure.

REFINISHING VARNISHED FLOORS

Attention, at the first sign of wear, pays. Unsightly mars caused by moving furniture are easily removed—also many other hints on keeping floors in shape.

TWO SIMPLE SERVING TRAYS

Trays, decorated with glass, mirror, monel metal or copper tops, the latter in attractive repoussé, are inexpensive to make and will sell at handsome profits.

LIVING-ROOM GARDEN

Dressing up your home with plants and flowers, held in wrought-iron brackets or stands, which, combined with lighting fixtures, give pleasing effects.

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THAT'S THE *Thrill of the 1935* **HARLEY-DAVIDSON-**

Give it wings and it could almost take you to Mars like a rocket — the new '35 Harley-Davidson.

Boy, oh boy! You should know the tingle that creeps through you when you "take off" astride this plane-on-wheels. It begins when you kick the starter pedal. It grows stronger when you tip in the clutch and twist the throttle — it becomes a glorious thrill when you are zooming along out in front, never to be headed.

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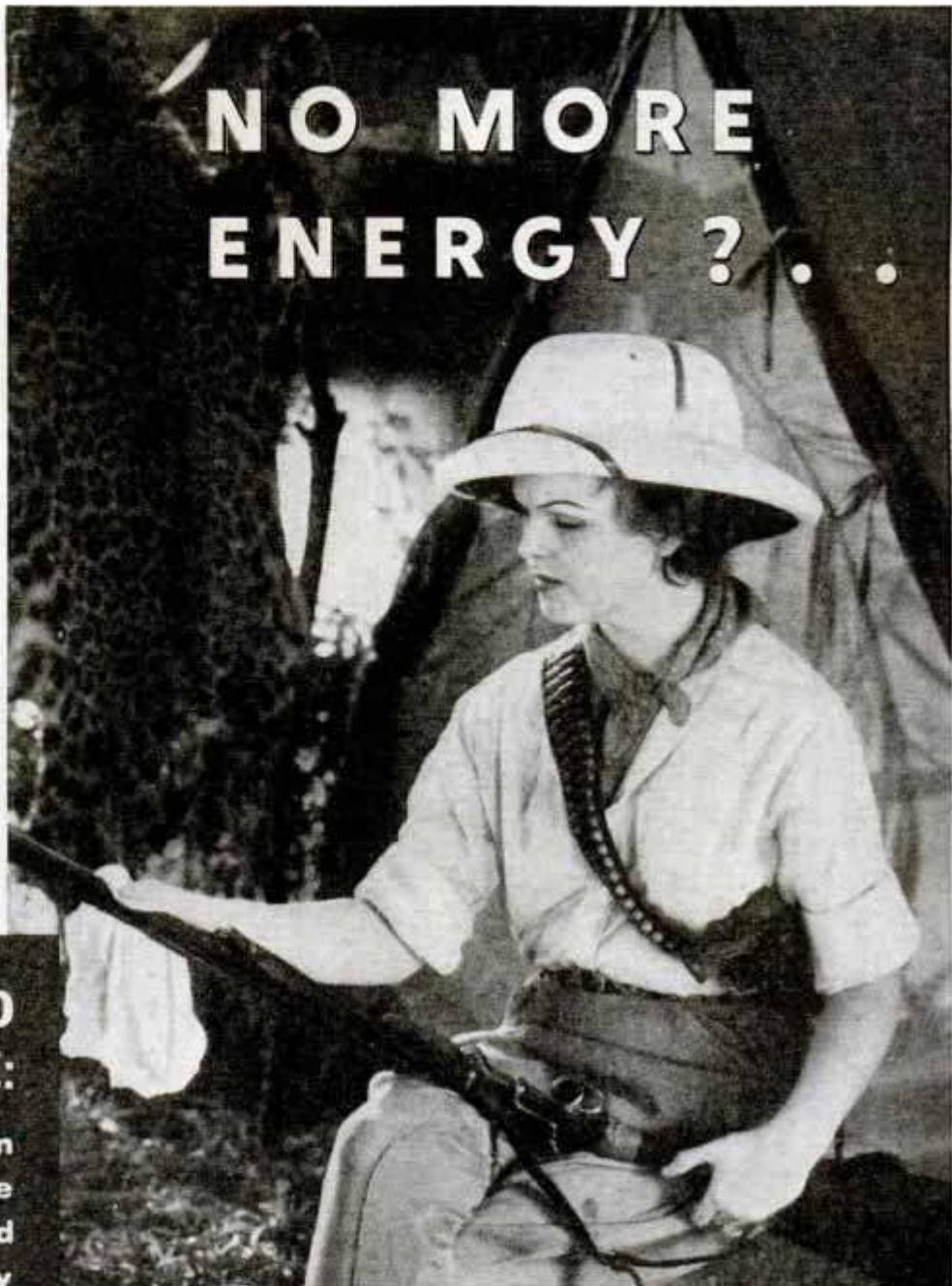
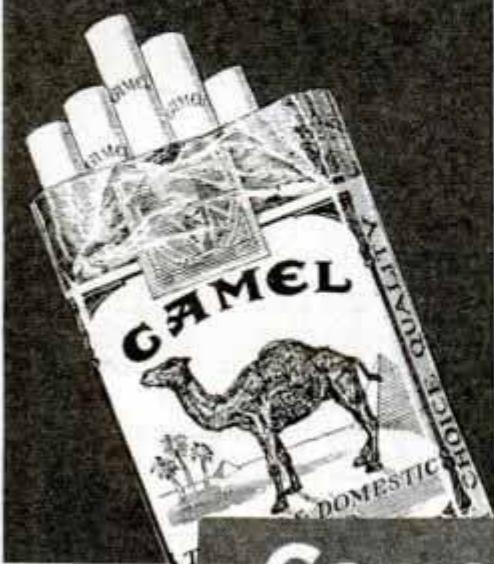
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My age is () 16-19 years, () 20-30 years, () 31 years
and up, () under 16 years. Check your age group.

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"Camels are made from finer, More Expensive Tobaccos—Turkish and Domestic—than any other popular brand."

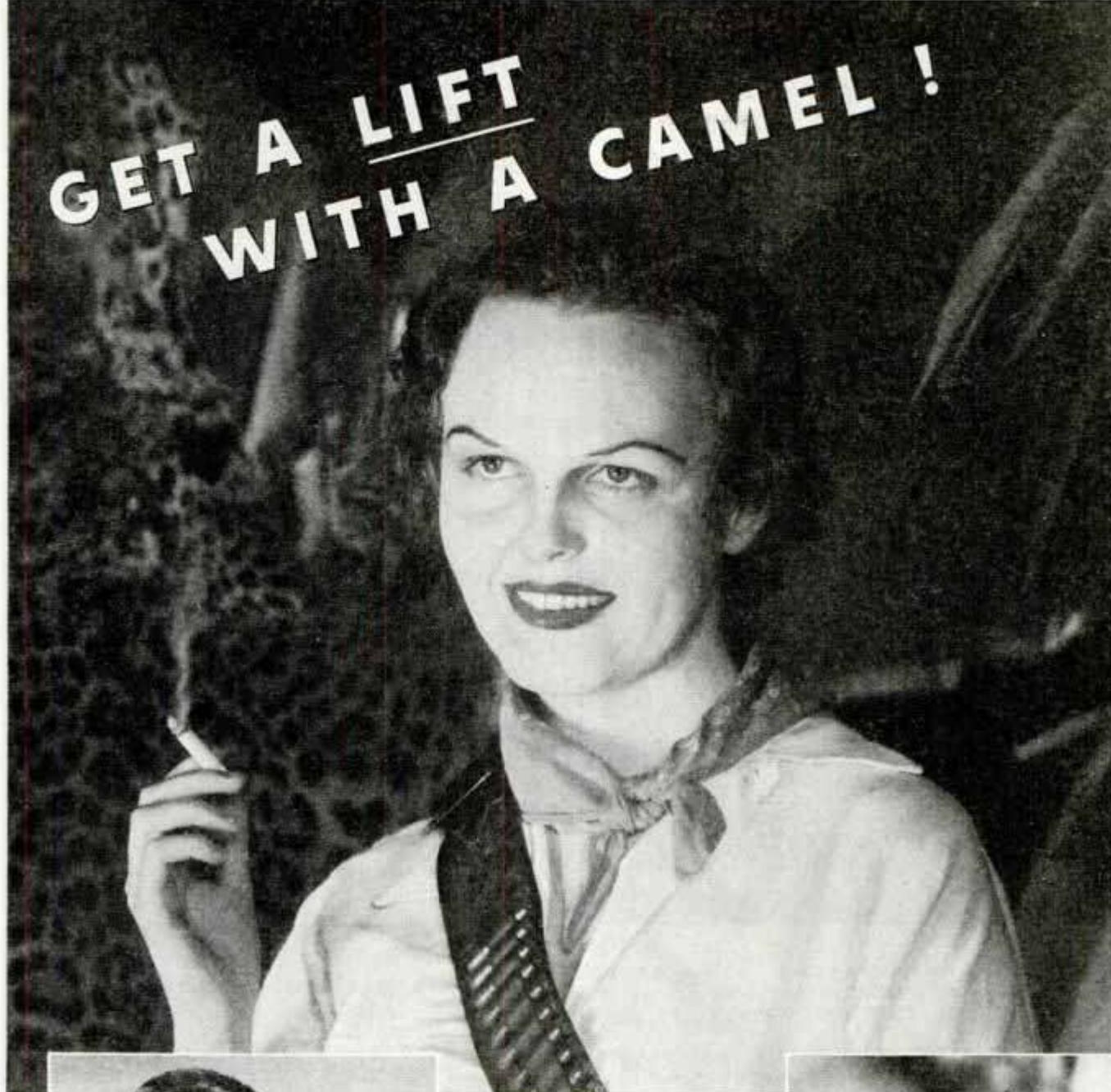


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GENERAL ELECTRIC
MAZDA PHOTO LAMPS

FROM DRAWING BOARD TO PROVING GROUND

(Continued from Roto Section)

specifications for a full-size car and all its parts and from these new specifications is built by hand the first car of its kind. New engine developments and all the mechanical improvements available are incorporated into the "baby" to make it a husky forerunner of the new line. Finally, the car is ready for exhaustive tests on a secret proving ground. If the results are satisfactory, the "go" signal is flashed to the factory and to parts makers. Workmen are called to body plants and to engine assembly lines. Steel starts moving in from the foundries.

Assembled bodies move down huge conveyors to paint-spraying booths, through baking ovens to the trim and polishing lines, thence to the final assembly line. Engine production starts simultaneously with operations in the body plant. Machines, almost human, bore all of the cylinders in a block at one operation. The blocks move slowly between two lines of workmen until the finished engine emerges for a two-hour test run on a block and to be subjected to a device that shows the amount of horsepower.

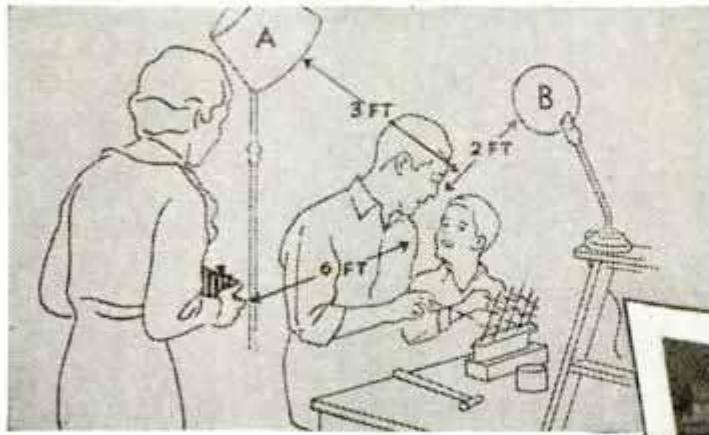
Final assembly starts with the chassis, which is lowered to the line from a conveyor. As the chassis moves down the line slowly, workmen on either side perform assigned tasks. Springs are added, wheels go on. The engine is swung into place. The body is lowered and bolted on. Electricians add the lights and test them on a screen hanging across the moving line. Then between rows of inspectors, the car moves to the other end of the plant and out to the public.

The engineering laboratories of an automobile company are never idle. Engineers are working all the time on improvements for every part of the new cars, each engineer being assigned to some particular part of the car. For instance, an entire corps of engineers in one laboratory has been working for years on new transmission developments. When completed and deemed practical, these developments go into the new models.

In the laboratories, thousands of tests are conducted each year. Every new improvement is subjected to the most severe

(Continued to page 126A)

Try a snapshot like this *Tonight*



HERE'S ALL YOU HAVE TO DO

Use Kodak "SS" Film. Set your camera for 1/25 second—Open the lens to f.6.3. Put 2 Mazda Photoflood bulbs in lamp A—1 in lamp B. Distances as indicated. Sight the subject, click the shutter—and you've made the picture.

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Just use any camera with an f.6.3 (or faster) lens, loaded with Kodak Super Sensitive Panchromatic Film. This high-speed "SS" Film does the trick—it's three times as sensitive as ordinary film under artificial light. Two or three Mazda Photoflood bulbs give ample light.

Just hold the camera in your hands as you would outdoors, set it for 1/25 second, open the lens to f.6.3. Sight the subject, click the shutter . . . and you've made a *snapshot*. *Indoors . . . at NIGHT*.



ALL YOU NEED FOR SNAPSHOTS AT NIGHT



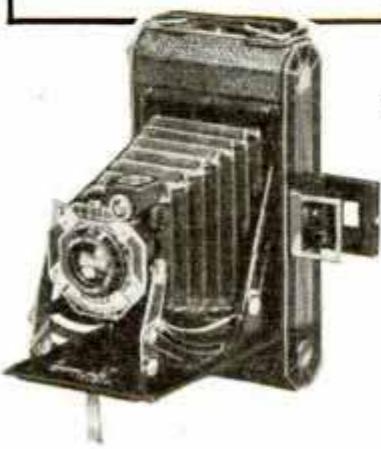
KODAK "SS"—the lightning-fast film, with the green lightning flashes on the familiar yellow box—the film that, indoors or out, in any light, improves picture quality.



MAZDA PHOTOFLOOD BULBS give brilliant light . . . last for two hours, enough for many pictures. Cost but 25¢.



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KODAK SIX-20

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Here's a book you'll want. Complete details about indoor pictures with Photoflood and Photoflash bulbs. Tells you how to make outdoor night pictures of lightning, lighted buildings, fireworks. How to make moonlight photos. Write to Eastman Kodak Co., Rochester, N. Y.

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P.M.
2-11

LOOKING AHEAD WITH "BOSS KET"

(Continued from page 207)

around the engine, and then we've tucked the passengers into any space that was left. From now on man is going to be given the first consideration. And that will be true about everything else in tomorrow's America."

I suggested that the man of tomorrow might have a new home.

"He certainly will," Kettering answered. "He will live in controlled atmosphere. This phase, 'air cooled' is entirely misleading, for controlled atmosphere not only means that the air will be cooled—or heated in winter—but that it will be washed and cleaned and the proper amount of moisture put into it or removed from it. This will have a profound effect on the life and comfort of man. But nothing can be done effectively until we find a proper double-window insulation."

"How about the portable steel house?" I asked.

"I have little faith in it," he replied. "The cost of transportation will be too great, for one thing. Each section of the country will use the type of material that is at hand. But our future scientists will solve all that later. All we've got to know is that there will be change. It'll give these young job-seekers something to do to think it out."

I mentioned Diesel engines and asked how development was going with them.

"Now, there is a case of exactly what I've been talking about," Kettering said. "The old Diesel engine had been here for twenty-five years and everybody thought it was a failure. It was only the type that was the failure and not the principle. During these past twenty-five years we've been booming ahead in metallurgy and when we applied the things we'd learned to many old failures we found that we'd solved fifty per cent of the problem immediately. When a fellow tries out something and it fails he must not off-hand condemn the validity of the idea. The principle may still be all right. It may be that some adjustment, some combination, some particular material, some technique is wrong. We've buried scores of principles in scrap heaps when it wasn't the principle at all that failed. And one thing everybody must get into their heads is this

(Continued to page 129A)

HOW TO GET LESS NOISE AND MORE DISTANCE

(Continued from page 264)

installations are shown in the diagrams. All coils are wound with No. 28 d.c.c. wire on fiber or bakelite tubing 1 in. in diameter and 3½ in. long. They should be boiled in paraffin when completed, for weather-proofing. When installing these coils, the one at the antenna may be mounted either in the open or housed in a shield can to protect it from the weather.

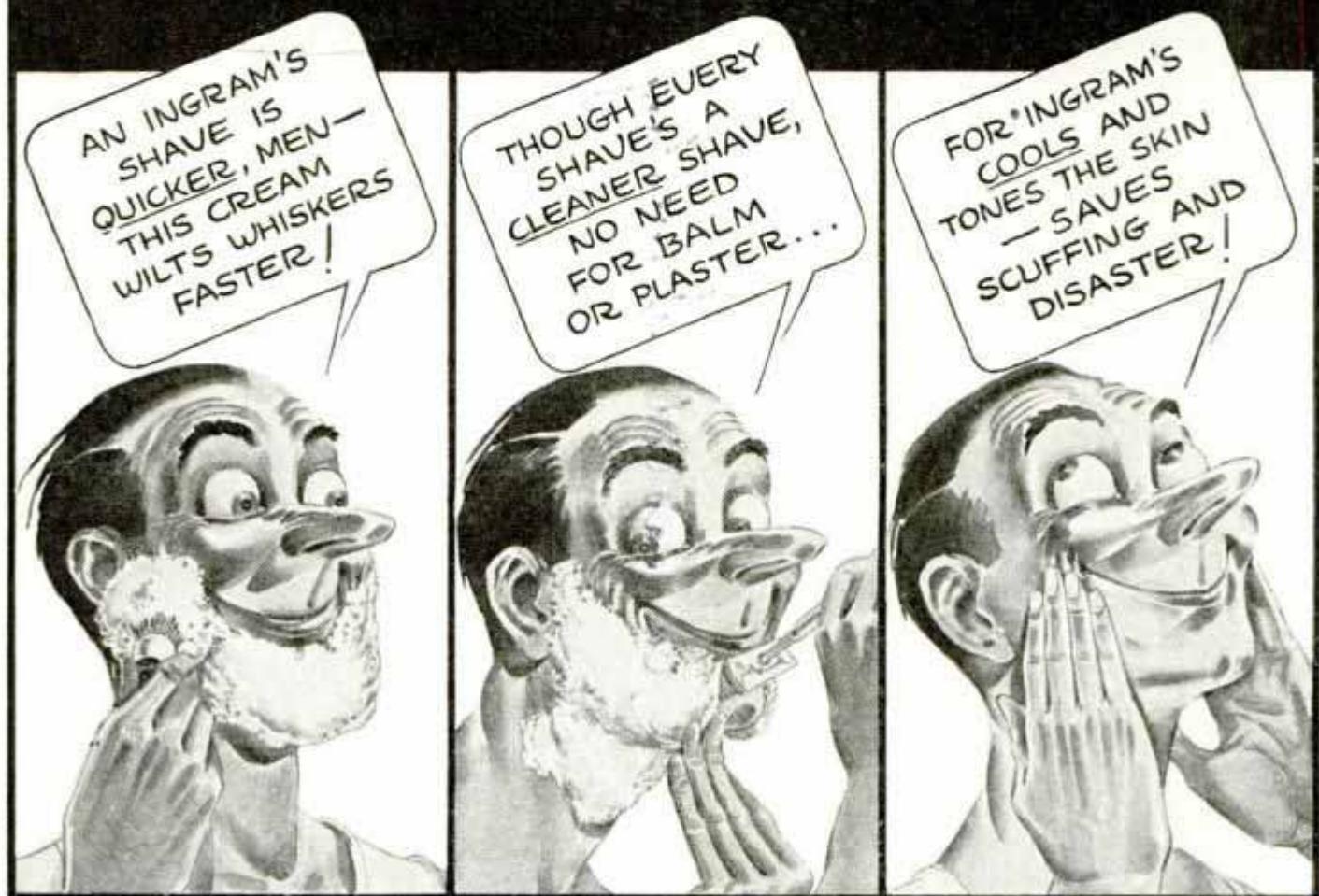
Three of the five coils to be described are shown in the photo. Fig. 1 indicates the coils and connections for the popular doublet form of antenna, especially useful in localities where the noise level is quite high. The coil and twisted-pair lead-in are connected in the center of the antenna. If shielded wire is used ground coils "A" and "B" as shown. These grounds are made to the shield which is also well grounded somewhere along its length, either to earth or a water pipe. If unshielded wire is used, omit the ground indicated on coil "A."

Figs. 2 and 4 show the connections for a twisted-pair transmission lead-in from one end of the antenna. In this case the lead-in must be a shielded pair. The connections for coil "B" are the same as in Fig. 1. The single-wire shielded lead-in is detailed in Fig. 3 and the coils at each end of the line differ from those previously shown. They also use the shield on the lead-in to provide the ground connections for the antenna circuit as well as for the receiver. The flat top of the L-type antenna should be about 75 ft. long and the doublet 35 ft. each side of the center connection for best short-wave results.

The coil-winding data are as follows: Coil "A," 112 turns, tapped at 45, 11, 11 and 45 turns. Antenna connection to both ends; center tap ground, if used. Lead-in is across both 11-turn sections. Coil "B," 115 turns tapped at 93, 11 and 11 turns; the antenna post of the receiver to the outer end of the 93-turn section. Ground to center of the two 11-turn sections; lead-in across both 11-turn sections. Coil "C," 132 turns, tapped at 110, 11 and 11 turns; antenna connection to outer end of 110-turn section, ground to center of the two 11-turn windings. The lead-in is connected across both 11-turn sections. Coil "D,"

(Continued to page 122A)

Quicker, Cleaner, Cooler Shaves with INGRAM'S



Try Ingram's Shaving Cream tomorrow morning, and enjoy a shave that's quick, clean and cool... without a trace of sting or burning.

Lather-up, and see! Special ingredients in Ingram's cool the shave and tone the skin—keep your face comfortable while shaving....

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SHAVE

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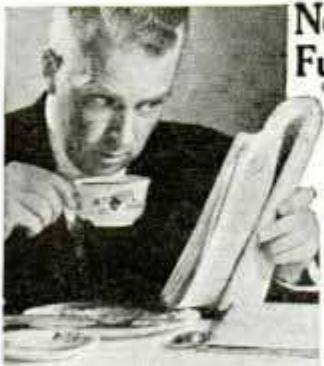
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Kansas City, Mo.

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A New, Faster, Safer Relief

You have heartburn, gassiness, indigestion because hasty eating, wrong food combinations or other conditions cause over-acidity of the stomach. To relieve your distress, reduce the excess acid—but don't alkalinize the stomach entirely or you'll stop your digestion entirely.

That is one of the dangers in drenching down half a tumbler of harsh, raw, alkalies. Also excess alkalies may seep into the system, affecting the blood and kidneys.

The new, advanced method is to take an antacid that acts only in the presence of acid. Such a remedy is contained in TUMS, the candy mint digestion tablet. After the acid is corrected, TUMS' action stops! If part is left unused, it passes out inert and unabsorbed. Try 3 or 4 TUMS the next time you are distressed. You'll be astonished at the quick relief—happy to have discovered a remedy that really "works," and is so easy to take. 10c a roll, everywhere. (TUMS contain no soda.)

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108 S. Aberdeen St. Chicago, Ill.

THE LATEST COMFORTS FOR THE WINTER MOTORIST

(Continued from page 244)

by occasional rotation of a handle that scrapes the filtering disks clean. Much anti-freeze will be saved this year because of the use of split replacement packings for water pumps.

Assurance of more healthful motoring this winter is given by the makers of a new device to convert a hot-water heater into a quick steam system. The unit used in this system is an all-in-one piece of fin tubing somewhat similar to a flash boiler. Using no more pressure than exists in the usual hot-water heater, this feature produces abundant heat without valves to restrict the flow of water. The by-pass system provides positive control of the steam in the boiler and automatically keeps this steam in a saturated condition, ideal for transmitting heat. With an outside temperature of ten degrees below zero, the system has raised car temperature to eighty degrees within fifteen minutes. It is also possible to purchase a complete steam heater, greatly improved over the pioneer types offered last year.

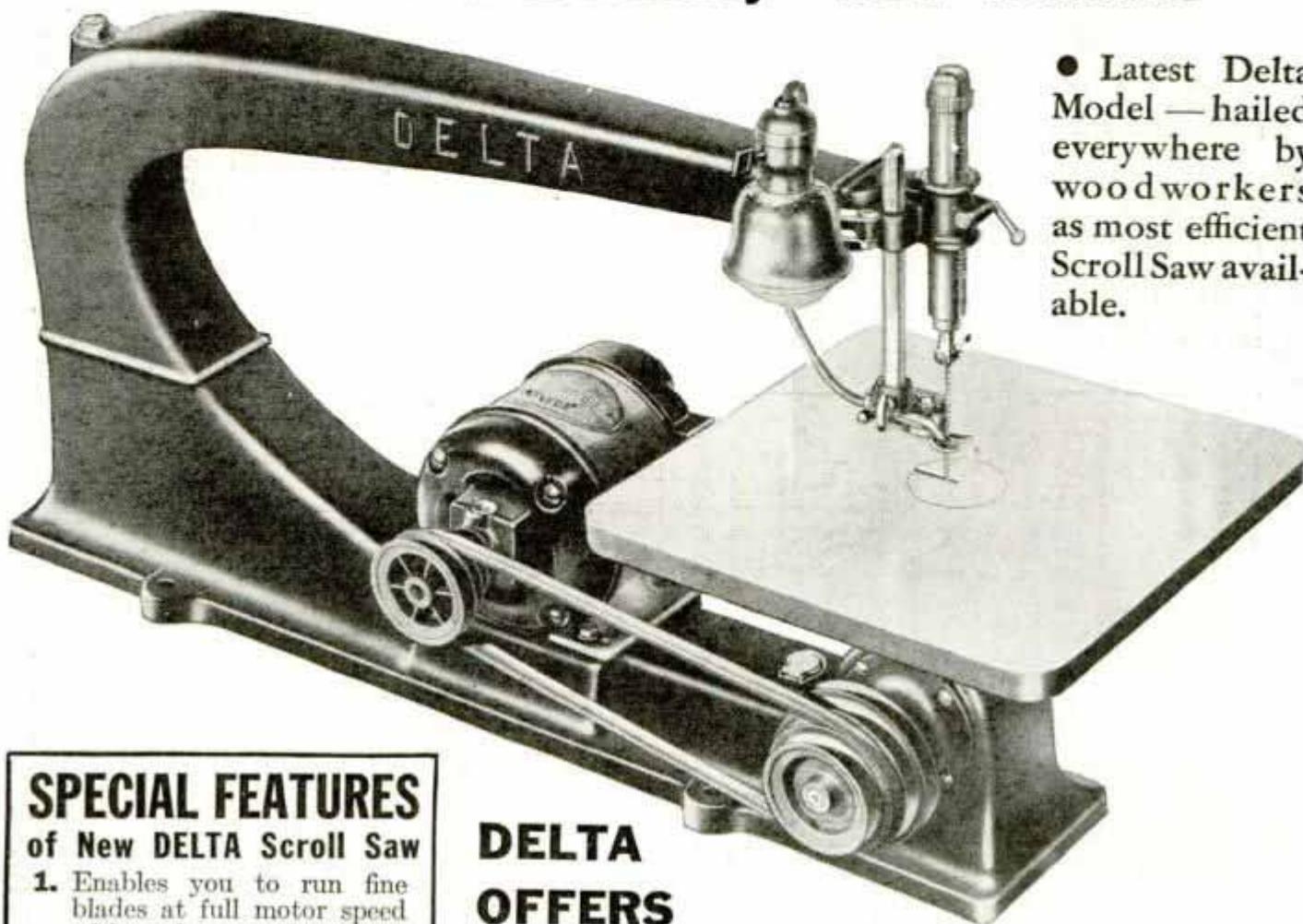
This winter several million cars are being operated with modern closed-body ventilating systems. To obtain the most from these systems it is important that the ventilating wings or slots should be opened the same on each side of the car.

Winter without service worry is one of the pleasures this year. There are the cars which have shackles and steering assembly automatically lubricated. Many cars are equipped with spring covers, and even the knee action on some makes is fully inclosed against snow, ice and dirt.

Of particular interest to the winter driver is the introduction of an automatic system of controlling motor temperatures. It starts the motor of the parked car when the radiator temperature drops below 120 degrees, then turns it off when the temperature rises to 145 degrees. The automatic action takes place even while the ignition and car doors are locked. The result is a warm motor in any weather. The starter will not operate if the car is left in gear. In addition to making starting easy, the system helps to keep the battery well charged. The cost of operation is said to be from one to two cents per hour while the car is parked.

New Scroll Saw

Has Increased Efficiency — New Features



SPECIAL FEATURES

of New DELTA Scroll Saw

1. Enables you to run fine blades at full motor speed without danger of breakage;
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DELTA OFFERS

New Line of Quality Tools

The new "DeLuxe" Scroll Saw is but one of the many new improvements and tools announced this year by Delta engineers. This year the Delta line of motor-driven woodworking tools is more complete than ever before. Delta standards of efficiency, quality, and convenience have been strictly maintained—and Delta prices still kept at their low levels. Good compact motor-driven tools are within the reach of all. Every woodworker will find the new 1935 Delta line of unusual interest.

Send for CATALOG

The 1935 catalog of Delta quality motor-driven tools is now off the press. It is crowded with photographs and information about the new line of 1935 Delta tools. It shows how Delta tools are built to stand the grind of production work, and yet are so low priced as to be within the reach of all. Send coupon so your name will be placed on the mailing list to receive the 1935 Delta catalog without delay. Enclose only 10 cents at same time for Book of Practical Delta Projects, 32 pages of new and novel things to make with many blue prints, working drawings, photographs and illustrations—and complete directions.



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NEW BOOK for WOODWORKERS

32-page book "Practical Delta Projects"—crowded with new and "out of the ordinary" things to make—with many photographs, working drawings, and easy-to-understand illustrations. Simple, complete instructions make every project easy to follow. Every woodworker should have this book. Send 10c with coupon. 1935 Delta catalog mailed postpaid.

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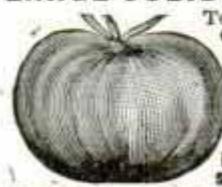
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HOW TO GET LESS NOISE AND MORE DISTANCE

(Continued from page 118A)

125 turns, tapped at 110 and 15 turns; antenna connection to outer end of 110-turn section, ground to other end of entire coil. The lead-in is taken from a tap 15 turns in from the ground end. Coil "E," 110 turns, tapped at 95 and 15 turns; antenna connection to receiver is to outer end of 95-turn section, ground to other end of entire coil. The lead-in is connected to tap 15 turns from ground end. When making the coils the experimenter should try changing the number of turns in the large winding of the coil at the receiver, in order to obtain the closest possible match for the coil in the set into which it feeds.

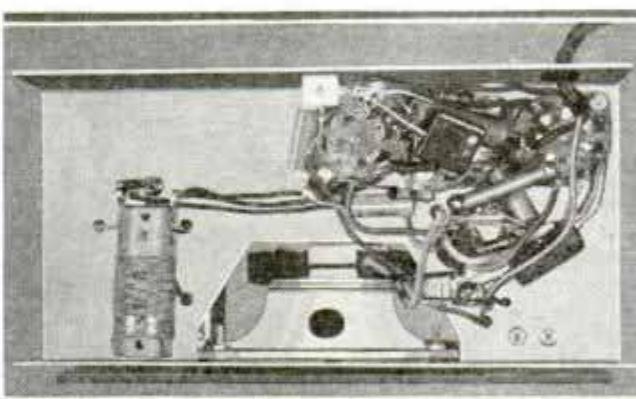
ECONOMY THREE A.C.-D.C. BROADCAST RECEIVER

(Continued from page 263)

ployed as a front panel and speaker baffle, as shown in the photos.

All tube sockets should be mounted with the heater terminals located just as shown in Fig. 3. An enlarged blueprint of all diagrams is available; those who wish it should specify blueprint R-206.

To balance the set, open the two-gang tuning condenser all the way out, then, with a small screwdriver, open both front and rear trimmers about 4 turns from the full in position. Now turn on the receiver and tune to about 25 on the dial, or a near-by point where no station is heard; the condenser plates should be about one-fourth closed. The next step is to adjust



the rear trimmer "TR" for maximum noise; when this is done, adjust the front trimmer for loudest hiss, or noise, in the speaker and the set is then in balance.

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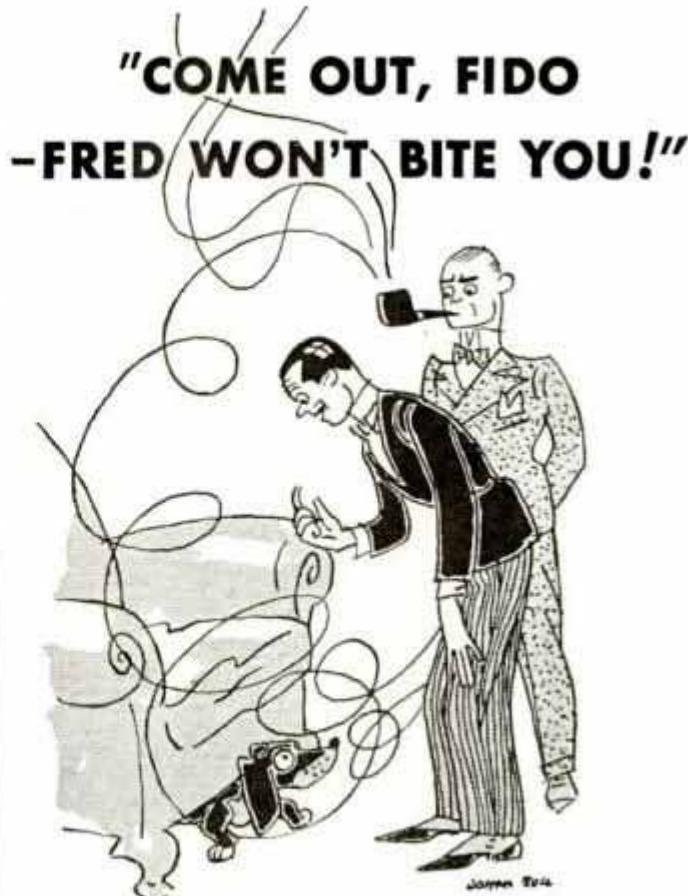
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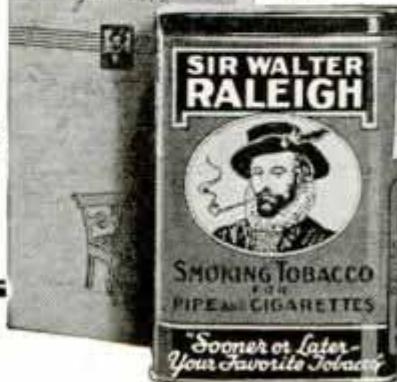
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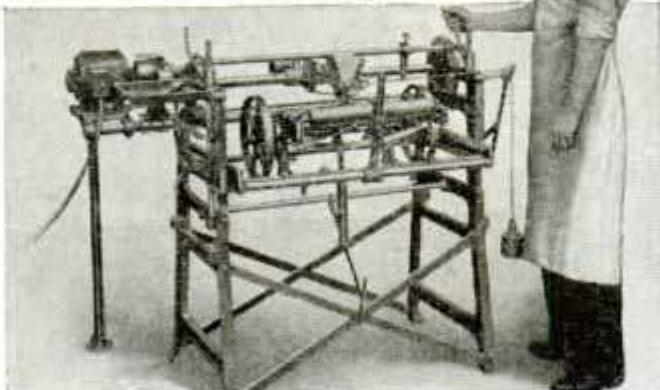
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EXPLORING THE MYSTERIES OF ICE AND SNOW

(Continued from page 181)

X-ray discloses the minute atomic architecture of crystals but this process has not yet solved the riddle of crystallization.

Even the more conspicuous performances of ice and snow present a great many puzzles to which science has not yet found satisfactory answers. A few years ago the curious little toothlike projections sometimes seen at the surface of ice formed in small cavities of rocks attracted much attention. These "ice-spines" were then regarded as rare freaks of nature, but plenty of fine examples can now be found on the ice cubes made in electric refrigerators. Their mode of origin is still a mystery.

Nature produces a great variety of snow sculpture by methods not fully understood. A strip of snow on a window ledge or the branch of a tree will sometimes slip down in the middle and hang in festoon shape, supported only at the ends, constituting what is called a "snow garland." Over a level or gently sloping surface of snow the wind occasionally rolls muff-shaped snowballs, known as "snow-rollers." Huge overhanging caps of snow formed on tree stumps and posts are aptly named "snow mushrooms."

The origin of the remarkable pinnacled snowfields seen on high mountains in the tropics and also found as far north as Mount Rainier, is also a mystery. F. E. Matthes, of the geological survey, believes the snow is evaporated rather than melted under the intense rays of the sun in cold weather to form the "sunpits" and "sun-cups" between the miniature peaks of snow and ice, the tips of which always point toward the sun at midday.

Why do the dead stems of certain plants—but only a few species—grow slender ribbonlike or shell-like fringes of ice during a single frosty night? The mystery of "ice fringes" has not been explained. Neither has red snow. Its color is due to microscopic organisms, but not, as usually stated, to a single species. Several kinds of algae and other low forms of life are now known to reddens snow, and there are several that give it other colors. Vast fields of yellow snow have been found in the Kara sea. Patches of brownish-violet snow occur in Greenland and on some mountains in the temperate zone.

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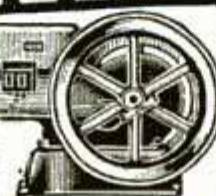
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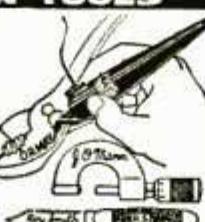
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Practically every householder spends at least \$10.00 to \$50.00 each year and many spend several times that much on the above and other simple repairs that can be made quickly, easily and well with Smooth-On No. 1.

With a can of Smooth-On you can save this money in your own home—and by doing similar repair work for others, you can make money.

No skill is required to make repairs and the amount of Smooth-On used on any one job seldom costs more than a few cents.

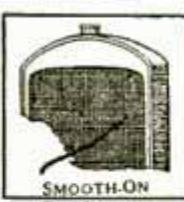
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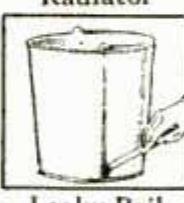
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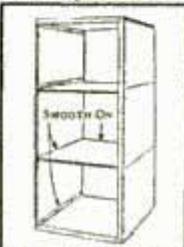
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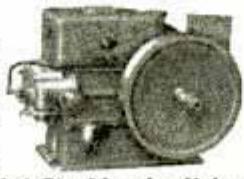
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CUSHMAN MOTOR WORKS, 900 No. 21st St., Lincoln, Nebr.



FROM DRAWING BOARD TO PROVING GROUND

(Continued from page 116A)

tests known, for efficiency, for wear and for performance in the hands of the driving public. New engines are tested under all kinds of temperatures, from oven heat to "cold room" weather of fifty and more degrees below zero.

To put any radical department from conventional design into actual production, factory engineers make special preparations. A training school is opened for welders and metal finishers. Perhaps, as in the case of the "Airflow" DeSoto, the design calls for large steel stampings for which methods of production and handling must be worked out. A new welding operation, called hydromatic welding, was devised to handle these large stampings and a new type welder, operated by oil at 600 pounds pressure, was developed. It completes as many as fifty spot welds in ten seconds when a button is pressed.

An innovation in automobile factory practice is the air "curtain," consisting of controlled drafts of cleaned, filtered and tempered air, flowing through paint-spraying booths to protect the workers from irritating paint fumes. The three to six-inch curtain, flowing downward to within a few inches of the floor, is maintained by large electric fans.

(Watch for "Breaking Them Up to Make Them Better" in next month's color section.)

"PROPS" OF THE RADIO DRAMA

(Continued from page 187)

Big effects are obtained simply. The crackling of a forest fire can be produced by means of Cellophane and strawberry boxes. These boxes are used to produce a crackling sound, or when held close to the microphone and twisted they give a splendid simulation of a crash.

In the jungle stories, the screeching of the monkeys may be produced by rubbing a cork across an ordinary milk bottle.

How to make sound effects sometimes is discovered by accident. One expert idly playing with a dollar bill found that if she pulled it taut and then relaxed it quickly it made a put-put-put sound. When produced before a microphone and amplified, this sound resembles that of a small boat's outboard motor.

D/459

DOUGLAS TELLS SECRETS OF SPEED

(Continued from page 215)

same pump. The flaps have reduced landing speed to fifty-eight miles an hour.

We look to synchronization of motors to cut out all propeller "beat." Propeller beat is the drumming sound heard when the "props" are not traveling at the same speed. Now we are attempting to tie one propeller into the other to lose this pulsation entirely. Already we have cut airplane noise down to sixty-eight decibels as compared with seventy-two in a standard Pullman. This has been accomplished through developing materials to absorb noise rather than deflect it. Noise deflectors are heavy but noise absorbers are lightweight and do not give us bulk.

As to the future, it is probable that Diesel engines sometime will be used for airplanes. Only one commercial type of airplane Diesel has ever been built, and it was of only 200 horsepower, not enough for today's demand. The engineer who sponsored it died and his work has been allowed to lag. The Diesel idea, however, presents a potential development because even with the heavier motors the weight of fuel supply could be cut one-fourth.

Then there are the possibilities of the stratosphere. There is such little resistance there that the 12,000-foot speed of a given horsepower and load will practically double at from 38,000 to 40,000 feet. Such an altitude would give one of our late type Douglas transports a pace considerably above 400 miles an hour.

Among all the problems of stratosphere flying, two fundamentals are outstanding: the demand for oxygen and the necessity for air pressure. Passengers cannot breathe and motors will not work without oxygen. In Douglas transports now flying at 18,000 feet over the Andes mountains there is an individual oxygen valve for each passenger. A still better plan would be to introduce oxygen into the ventilating air. This, of course, is closely related to pressure, for if you are going to fly in the stratosphere you will have to pump up the cabin to assure passenger safety and comfort. This presents problems not yet solved.

Do not think there is no limit to speed in the stratosphere. You can get into a range where what air there is becomes compressed and we believe the limit of pace

(Continued to page 142A)

**BUILD THEM IN YOUR OWN WORKSHOP**

Recently the manufacturers of CASCO Waterproof Glue made cash awards to the 25 homecraftsmen who submitted the best woodworking projects built with CASCO Glue during 1934.

These prize-winning articles have been assembled in the form of a most interesting and instructive book consisting of photographs and descriptions of these outstanding woodworking projects...inlaid card and game table, model hollow hull sail boat, unique tilt table made from cigar box wood, modern beverage set, beautifully patterned wood turned vases, lamps, smoking sets, cigarette boxes—and many others ranging from delicate wood jewelry to portable camp refrigerators.

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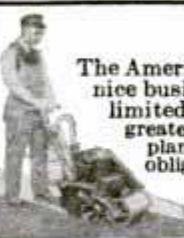
INTERNATIONAL TYPEWRITER EXCHANGE,
231 West Monroe St., Chicago, Ill., Dept. 201
Send Underwood No. 5 (F. O. B. Chicago) at once for 10-day trial.
If I am not perfectly satisfied I can return it express collect. If I keep it I will pay \$3.00 a month until I have paid \$44.90 (term price) in full.

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FREE LITERATURE . . . SEND TODAY!

CHEATING DEATH FOR A LIVING

D1311

(Continued from page 229)

I began the stunt. The building burst into flames and studio men pulled the wire. Not having been renewed, it broke. The fire climbed higher toward me. I sighted a small inlet close to the tower. I could not leap into the ocean against the strong wind, but by jumping to one side, I had a chance to land in the inlet, though it was only eight feet across. Previous experience of high diving into small tanks saved me. Making a successful shallow dive, I suffered only scratches from barnacles.

In nineteen years, the only injuries I have suffered were a broken wrist, several broken ribs and a few sprains and bruises.

What was my most dangerous stunt?

That's hard to decide. I remember though, the stunt which was the most strenuous. I contracted to do an original stunt—making a parachute jump from a plane 5,000 feet up, with another plane catching my chute by means of a hook attached to a twenty-foot rope. First, I arranged a similar rope and hook from the rafter of a sixty-foot studio stage. To this I fastened a parachute, just as it would suspend from the hook in the actual stunt. For three weeks I trained strenuously by climbing the parachute shrouds, then over the hook and on up the rope.

When the stunt took place, I jumped with two chutes—one for safety so if the hook tore loose I could descend with the other. As my parachute opened, the plane with the hook attached glided over me, pulled into a stall, hooked into my chute, then leveled out again. After assuring myself that the hook was secure, I began to climb the shroud cords. The weight of the second chute plus the strong wind caused me to twist and spin so much I couldn't gain any headway. Throwing off the second chute, I started to climb the shroud cords again. But on reaching the silk portion, it was hard to get a grasp.

I began to tire and to consider myself foolish for dropping the second parachute. My only salvation was to climb and yet conserve all the strength I could. Finally, after what seemed hours, I managed to gain the hook. There I rested a few minutes. When at last I climbed from there up the rope and to the landing gear, I knew I had completed the most strenuous stunt in my career.

LOOKING AHEAD WITH "BOSS KET"

(Continued from page 118A)

business of perseverance.

"We're all cluttered up with definitive knowledge and not factual knowledge. We give a name or a symbol or a figure to a problem and then stop. As a matter of fact we know very little about fundamental knowledge. We have learned to rely on the symbolic method of expression with the result that we have failed to find the fundamentals involved. Many of these were abandoned years ago and it may be our next job to go back and find lost fundamentals. Fifty or a hundred years ago when they established what might be called the fundamental philosophy of, let us say, physics they formed ideas and conceptions that under the test of modern science may be found totally wrong.

"In other words, we've been carrying into the future the errors of the past. And we can't do that. As a matter of fact we should be pretty choosey as to what we carry over in every phase of our life. We must keep changing. We must start each scientific cycle with a clean record. We're now entering the cycle of biological chem-

istry. We're going to study man. We're soon going to be as familiar with his hidden machinery as we are with an automobile engine."

"Just what will the next generation give us?" I questioned.

"I can no more guess than a man forty years ago could have prophesied just what the wonders of today would be," he replied. "By the way the late Dr. Samuel W. Stratton prepared a list of what he calls 'The Nine Wonders of the Modern World.' I'll give it to you for your Popular Mechanics readers."

I copied the list as it appears on a preceding page from a large printed card and "Boss Ket" walked toward the door with me.

"I can't get discouraged about America even if I tried," he said as we shook hands.

"We're all right. We've just got to go ahead and mind our own business and think up new things to make—and then there will be a job for everybody making them. We've got the things here to do it with—great natural resources, tools, sturdy people, imaginative minds. What we need most of all is a whole new crop of inventions. Tell inventors to get to work."

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FOR IN ALL
LEADING
COUNTRIES*Astounding
Invention***TURNS JUNK AUTO
TIRES INTO MONEY**ONE HANDY MACHINE KEEPS
FOUR HELPERS BUSY

Here is a new business. The product is so unusual that it has opened up a new market. Don't confuse FABRIX with a "Door Mat." It has a hundred INDUSTRIAL uses in factories. Your sales for home use will be the least part of your business. Here is an opportunity for one man in each community. Under our license you can establish a local manufacturing plant. The investment required is reasonable.

COSTS NOTHING to get complete facts. Rush your name and address and we'll send complete description of simple machine that quickly slices

old tires into uniform strips; show you how patented method forms strips into springy, long-wearing FABRIX Mats; how you can turn a 5¢ tire into a \$2.00 mat; how you can start on a reasonable investment and build a business so big, so fast, that it will take your breath away. Capable men, responsible men, big men, are the ones we want in this enterprise. If you are that kind don't delay a minute. Write, air mail or wire today. All information is free.

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dropping every-
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Your Battery
for a NICKEL
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10 to 6 Ampere AUTOMATIC
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PLUGS in any lamp socket. Charges any auto-type battery overnight. Creates no radio interference. Uses no expensive bulbs, "dry units" or messy liquids. Has only **One** moving part, replaceable for \$1.00, after thousands of hours' use.

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Retail Price

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Rolls Dirt Out

At last a practical comb cleaner. Removes 100% of dirt and dandruff from combs in a flash. No fuss. No bother. So simple a child can operate. Works on a new exclusive patented principle. Fills crying need.

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Exclusive. No competition. Ten second demonstration utterly convincing. Prospects buy quickly and eagerly. Distributors sold 30,000 to 50,000. One drug chain ordered 40,000. New triple profit selling plan puts you in the big money. Write today for confidential price to agents and distributors. Regular price 35c. Agents can get sample for 25c.

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HAVE YOU A MASTER MEMORY?

(Continued from page 197)

rolls can be memorized and then repeated.

Have a spectator call out and write down a list of fifteen initial letters. Like this: R. Y. H. T. E. D. I. H. T. B. M. F. P. A. G. Your job is to make up a sentence from these initials, using the initial for the first letter of each word in the sentence. Like this: Royal Yachts Headed To East. Down In Hold Ten Bad Men Fishing Pork And Gunpowder. A silly sentence, yes, but say it once or twice and you can readily write down the entire list of fifteen initial letters by simply repeating the sentence in your mind and writing down the initial of each word. Twenty-five to forty letters can be "memorized" in this way.

Or hand a spectator a deck of cards and request him to remove any four similar cards, such as the four kings. Take the deck back and explain you have such a retentive memory that you can instantly spot the cards removed by simply riffling once through the pack. Do this riffling the cards slowly. Keep your eyes on the indexes. Do not try to remember any individual card, but merely watch the cards carefully as they go by. After you have finished, stop for a moment and think. Did you see an ace? Yes. Did you see a two-spot? Yes. The three-spot, four, five, six, seven? Now, wait. Did you see a seven? No, no seven. "The cards you removed were the sevens!" you announce.

Many mathematical stunts go under the guise of memory feats, one of the most popular being the "calendar test." The performer is speaking: "What day does Washington's birthday come on? The twenty-second, sure, but what day? You don't know? Why, Friday! October sixth, 1935, comes on Sunday; November twenty-second, 1934, fell on Thursday. Tell me your birthday, and I'll tell you what day it comes on!"

As shown in the example, the stunt is simply a matter of adding three numbers together and dividing by seven. A remainder of one means Monday, two means Tuesday, etc. If there is no remainder, the day is Sunday. Two of the three numbers in the simple calculation are obtained from the memorized table, while the other number is the date itself. Aside from entertainment, the calendar test is often useful in everyday life.

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and fields
this winter



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RCA Licensed Automobile and Home Radio Sets for American, European and South American Reception. Beautiful World Master floor model radios. **Guaranteed foreign reception.** Custom made with exquisite all matched walnut cabinet, airplane dial, twin illumination, dynamic speaker and automatic volume control. Given away absolutely FREE with our new sensational unique PUNCH SALES CARD PLAN. This is the opportunity of the year—make up to \$150 cash each week for yourself. Every home, car owner, store, office, factory, lodge, club or individual wants these marvelous new FREE RCA LICENSED RADIOS.

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A new invention—at the lowest price in the field. The Palmgren Angle Vise—uniquely graduated in degrees—for all production, tool and general shop use, saves hours in welding and setting angle plates, making jigs and fixtures. Makes it possible to cut, drill or grind any angle by means of one, quick, simple adjustment. Has greater strength and holding capacity than ordinary vise. Width: 2 1/2 inches. Opens 2 inches. Weight: 10 1/2 lbs. Construction guaranteed. SPECIAL LIMITED OFFER—only \$5.95 plus postage. Or, send \$2.00, pay postage for express money balance due. Send at once.

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Soldering Iron and Blow Torch IN ONE! Light, portable. Eliminates pump, pressure system, stove, charcoal—all!

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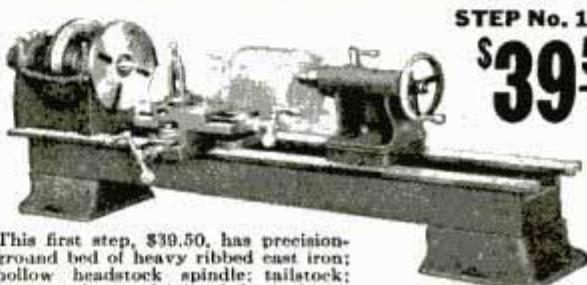
Cast Aluminum. Most Modern Offered—3 cars. Size 43" x 12"—constructed for electric power—perfect streamlining—great strength—true design. Drawings to build your own—18" x 24"—50c. Price of Kit \$3.00.
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Here's a lathe that meets every need economically. As your shop grows you can add to it, UNIT by UNIT, until you have a fully equipped, back-gear, screw-cutting lathe, capable of every kind of lathe work—as fine a tool as a man could wish for.

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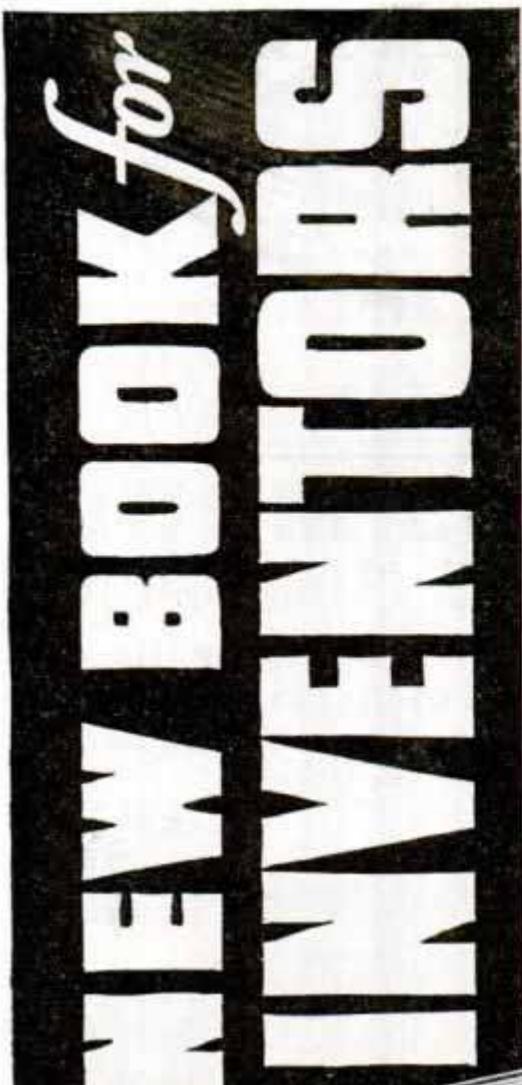
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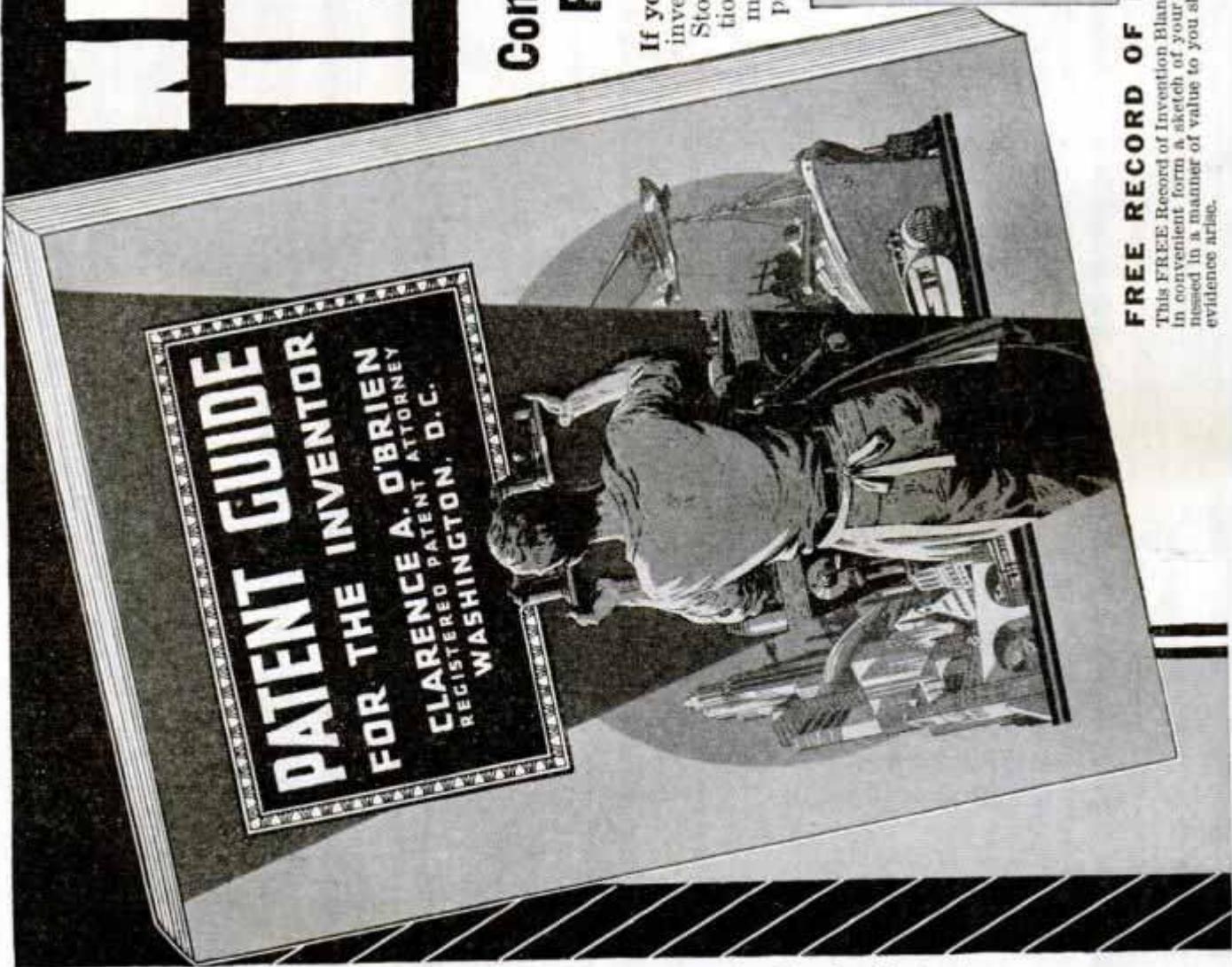


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THE NEXT WAR IN THE AIR

(Continued from page 165)

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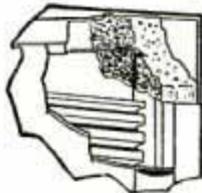
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SECRETS OF MORE MILES PER GALLON

(Continued from page 223)

Elmore tells the owner. "I put my foot only half way down, releasing all the fuel that the engine needed and saving the rest." In a dynamometer test with an engine that developed full power at the equivalent of twenty-five miles an hour, one-tenth of a gallon of gasoline operated the engine for two minutes and twelve seconds when the throttle was half open. With the throttle wide open the same amount of fuel was consumed in one minute and twenty-seven seconds and no additional horsepower was created. In other words, the engine developed just as much power and ran nearly twice as long at half throttle as it did at full throttle.

"Another thing," Elmore continues, "you drove the car as fast as it could be driven in the lower gears, while I shifted into second at ten miles an hour and into high at twenty-five miles an hour. That's fast enough for normal driving and allowed me to save fifty cubic centimeters of gasoline on that one start."

"Also, you tried to beat the normal flow of traffic. Speeding faster than the regular traffic flow necessitates an excessive use of the brakes and every time you jam on the brakes you throw away most of the gasoline that was used to get the car up to speed. One of the reasons I used less fuel coming back was that I used the brakes less often."

Champion economy run drivers who win "stingy" competitions have no special secrets that help, Elmore says. Economy is achieved by constantly watching the fine points of driving. Nearly any one, he says, can get surprising mileage by watching their driving habits and training themselves to observe a few simple rules. Excessive high-speed getaways from intersections, perpetual gunning of the motor through traffic and on the highway, and racing the motor while standing still are three things drivers in economy runs refuse to do.

"An erratic driver with a nervous foot on the accelerator wastes almost as much gasoline again as his motor needs," Elmore declares. "Besides, a driver who is continually gunning his motor seldom travels as far in a day as does the steady,

(Continued to page 138A)



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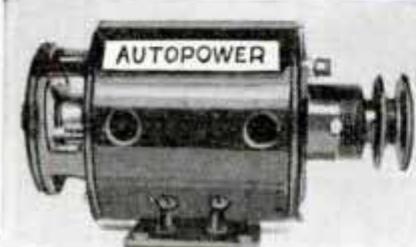
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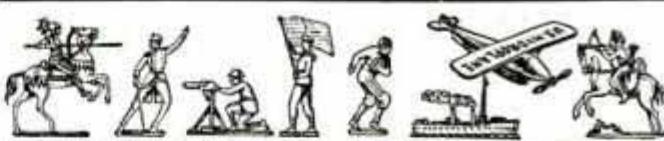
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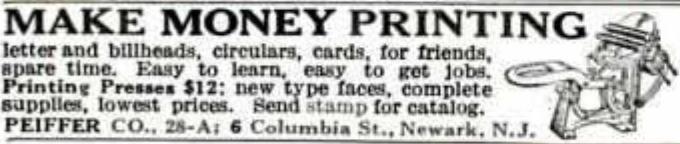
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SECRETS OF MORE MILES PER GALLON

(Continued from page 136A)

consistent driver. Economical driving requires holding to a steady speed with a steady increase of speed when you want to go faster. Consistent driving also repays a motorist in maximum mileage for brakes and tires, fewer repair bills, and less danger of accidents.

"Most engines today are carbureted and timed to give maximum efficiency between thirty and thirty-five miles an hour. If you drive your car consistently between thirty and forty-five miles an hour you will average around thirty-seven miles and obtain close to peak efficiency. That is a good speed to average on a long trip. Fuel consumption goes up rapidly at high speeds. One engine manufacturer reports that it takes thirty-four per cent more fuel to drive at seventy miles an hour than it does at sixty miles an hour, although only thirteen per cent more fuel is required to drive at fifty than is used in driving forty miles an hour."

Can a motorist who has been getting seventeen or eighteen miles a gallon jump his mileage way up merely by overhauling his driving habits? Not unless his car is in good mechanical shape and he keeps the motor scientifically tuned up, the test drivers say. Low-grade gasoline, an engine that runs too hot or too cold, late spark, dirty distributor points, and bad spark plugs are conditions that result in low mileage. Burned or oil-soaked distributor points, spark plug gaps too far or too close, sticking or leaking valves and valve tappets set too close, must be corrected before economy can be obtained. Another cause of poor performance is dragging brake linings, which do not always advertise themselves by squeaking. Carburetor mixtures are frequently too rich and the carburetors on nearly every car can be adjusted to give better economy without impairing performance.

Most economy drivers use the light No. 10 oil in the crank case instead of the heavier grades. In the transmission and differential, the rule is to use greases as light as will economically stay in the units. Finally, the drivers maintain high tire pressures, using forty pounds pressure in the rear tires and forty-two pounds in front for best economy.

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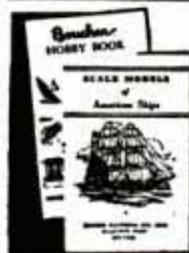
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D1367 NEIGHBORS OF THE AIR

(Continued from page 235)

on the air at regular intervals. They must be within the limits assigned, and the hams have little left with which to work since commercials have taken over many of the ham-developed high frequencies.

They are an honorable bunch, these hams, but have learned ways and means also, since the days when a five-watt tube sold for a tidy sum, and the puzzled milkman could never quite understand the acute shortage of pint milk bottles until he wandered uninvited into a ham's shack. He found all the stray milk bottles lined up like a battalion of soldiers, filled with a saturate solution of borax and doing duty as high-voltage rectifiers!

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Who are they, these ham fellows? The doctor, the preacher, the student, the prize fighter—all banded together in the common zeal to improve radio. They keep a written record of every message sent or received, they are sworn by the federal communication commission never to betray the text or meaning of any message sent, received or intercepted. They are never too busy to speed your message on its way to the far corners of the earth.

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Illustration

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UNCLE SAM—INVENTOR

(Continued from page 251)

two government scientists have insured for American rice a higher percentage of whole kernels, and a flavor now associated only with certain special types of imported rice. These scientists, Jenkin W. Jones and J. W. Taylor, of the bureau of plant industry, have applied for a public-service patent covering the discovery and soon the process will be free to all the rice millers in the United States. It consists in soaking the rough rice in water and then steaming under pressure a sufficient time to gelatinize the kernels. The rice is then thoroughly dried and is ready for milling. The moist heat treatment toughens the grain by merging the starch grains into a solid mass which becomes very hard on drying.

Another valuable public-service patent recently granted is that to Robert J. Cheatham for a mesh marketing bag. This bag permits a housewife to see sacked potatoes, oranges and other fruit while at the same time saving the grocery man's time and hers through sacking up the food.

As an inventor Uncle Sam is the world's greatest and as a dispenser of his discoveries to the public he is unsurpassed.

DOUGLAS TELLS SECRETS OF SPEED

(Continued from page 127A)

to be between 500 and 600 miles an hour.

There is a question as to whether or not the United States is big enough to warrant stratosphere work, for when you use the stratosphere you have to cut pay load and take on gasoline. This means transportation cost per passenger carried would increase and casts doubt on potential profit.

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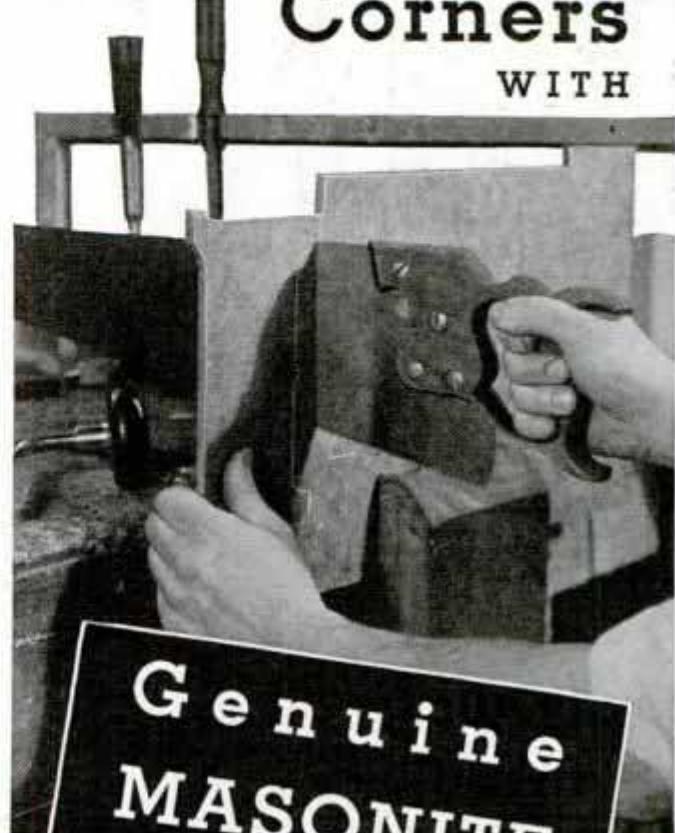
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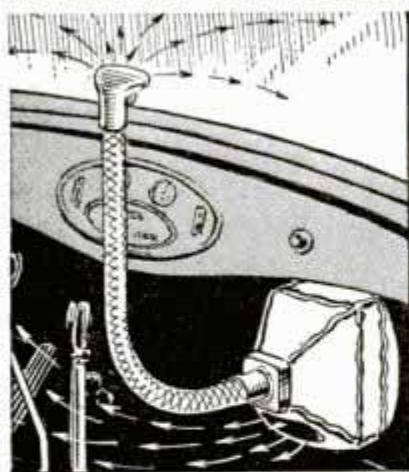
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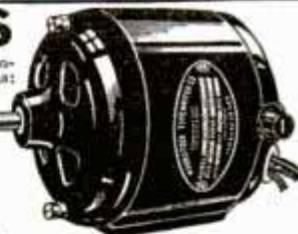
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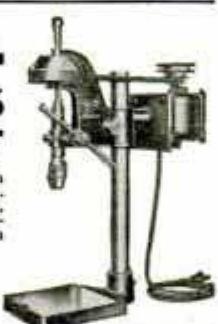
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Why risk infection from cuts, bruises, burns, blisters or insect bites when it has been proven by standard tests that Lucky Tiger Ointment quickly destroys such germs? FREE Generous sample Free upon request. Lucky Tiger Mfg. Co., Kansas City, Mo.

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Three tools in one. Three speeds. Full floating pulley with elite bronze bearings. Drills to the center of 14 in. circle. Highest quality, precision built. Amazingly accurate, fast, safe, and dependable. Write for Free Folder and sensational Direct-To-You Prices. Also get lowest prices on Blue Star WOOD LATHE and BAND SAW.

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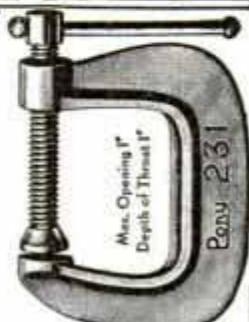


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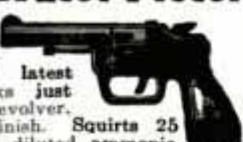
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A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the lead in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. Price 10c, 3 for 25c, p.p.d.



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HARMLESS ACCURATE



25c
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Here it is, boys. You can have an immense amount of fun with this new pistol. It shoots 12 to 15 ordinary peas without reloading. All you need do is to load the gun with peas, pull the trigger and keep on firing until the barrel is empty. Then reload and fire again. It is absolutely harmless and safe. Nothing to explode. These pistols sell like hot cakes, so get yours AT ONCE. Be the first boy in your town to own one of these automatic repeating pistols and be the envy of all the other kids in the neighborhood. PRICE ONLY 25 CENTS Holster for Peamatic 25c.

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The Auto Bomb is attached to the motor of your car, fastening one wire to the spark plug terminal and the other wire to any part of the motor to serve as a ground. The instant your "victim" steps on the starter, there is a shrill whistle, followed by a loud bang. The driver thinks his car has exploded. Can be attached in a few seconds. Does not harm the car. Gives you more protection than an insurance policy—catches the thief in the act. PRICE 15c Each, 3 for 40c. Shipped by Express, not prepaid.



CHAMELEONS—25c LIVE, SAFE DELIVERY GUARANTEED

Watch it change its color!



Get one of these most wonderful of all creatures. Watch it change its color. Study its habits. Wear one on the lapel of your coat as a curiosity. Watch it shoot out its tongue as it catches flies and insects for food. No trouble to keep. Can go for months without food. Measures about 4 inches in length. Shipped to any address in U. S. A. by mail. We guarantee safe arrival and live delivery. PRICE 25 CENTS POSTPAID. Specially prepared Chameleon food 15c.

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LATEST CATALOG

JOHNSON SMITH & CO.
RACINE, WIS.

\$75
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for the 9-in. x 3-ft.
Back-Geared, Screw-Cutting
"Workshop"
Bench Lathe

on Easy Payment Terms

You can buy this South Bend Lathe Direct from the factory for only

\$19 Down
\$6.50 a month

THE new 9 $\frac{1}{8}$ " swing by 3' bed Workshop Bench Lathe turns, faces, bores, cuts threads and performs all kinds of machining operations on cast iron, steel, all soft metals, wood, compositions and other materials. Has the power to reduce the diameter of a steel shaft $\frac{1}{4}$ " in one cut. Takes 18" between centers; weighs 300 lbs. Constructed entirely of cast iron and steel. It is a rigid, powerful, accurate, modern lathe.

FEATURES include back-geared headstock with six spindle speeds; cuts threads 4 to 40 per inch; has automatic longitudinal feed to carriage as fine as 350 per inch; graduated compound rest; $\frac{1}{4}$ -in. hole through spindle; three V-ways, one flat way on bed; all gears machine cut of steel and cast iron. It is a genuine South Bend Lathe, accurately built and recommended for the most accurate work.

PRICE of \$75 includes bench lathe complete, as illustrated, but does not include motor drive. Price with motor drive, including $\frac{1}{4}$ H.P. reversing motor and drum reversing switch as shown \$94. Other bed lengths 3 $\frac{1}{2}$ ', 4' and 4 $\frac{1}{2}$ ' in Bench type and Floor leg type, countershaft and motor drive at similar low prices, on Easy Terms.

96 Other Sizes and Types on Easy Payments Direct From The Factory

ment with the order and paying the balance monthly. Listed below are a few popular sizes:

Size of Lathe	Weight Lbs.	Price C'shaft Drive	Down Payment	Monthly Payment
9" x 3' "Toolmaker"	325	\$140.00	\$ 31.00	\$ 9.00
9" x 3' Junior	375	170.00	35.00	11.50
9" x 3' Std. Chge Gear	420	225.00	45.00	15.50
11" x 4' Std. Chge Gear	710	300.00	60.00	19.50
13" x 5' Std. Chge Gear	1090	352.00	75.00	25.00
16" x 6' Std. Chge Gear	1840	480.00	100.00	29.00
16" x 8' Std. Chge Gear	2000	520.00	107.50	30.50
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Get a copy of this valuable and instructive 32-page catalog illustrating, describing and pricing the 9" Workshop Lathe and all its accessories and attachments. If interested in a larger lathe, also ask for General Catalog No. 94. Mailed free postpaid, to any address.



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Swing..... Length of bed.....

Countershaft Drive..... Motor Drive.....

My work is.....

Name.....

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City..... State.....

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PORTABLE**

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MONEY BACK GUARANTEE



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Hundreds of jobs are waiting for people who can type. A typewriter helps put your ideas on paper in logical, impressive form...helps you write clear, understandable sales reports, letters, articles, or stories. A Remington Portable has started many a young man and woman on the road to success.



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If you want a gift for birthday, Christmas, or graduation...one that Father, Mother, Sister, or Brother will use and appreciate for years to come, give a Remington Portable. It's the one gift that can be used with both pleasure and profit by every member of the family.

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New wage scales in our own factories, and in the factories of the companies which make our materials, point definitely to higher prices. Stocks of machines on hand make possible the present unbelievably low cash price on this machine. Everything points to higher prices. We cannot possibly guarantee this low price in the face of constantly rising costs in every one of our departments. So we say... "Act fast!"

10 DAY FREE TRIAL OFFER

You can try this machine for 10 days without risking one penny of your money. Not even shipping charges. Send for complete details on this most liberal offer. Get attractive new catalogue illustrating and describing the many Remington models available on unusually low terms. Clip coupon today!

EVERY ESSENTIAL FEATURE found in Standard Machines

Buying a typewriter isn't like buying a suit of clothes. Many Remington portables, seeing 10 years of hard service are still in active use. When you buy...buy a machine with every standard feature. The Remington No. 5 is the most compact and durable portable ever built...includes all essential standard typewriter features. This beautiful machine

represents the height of economy... unequalled economy in first cost... unequalled economy in service.

It is today the best value ever offered in typewriter history... and that statement comes from the company that has constantly made typewriter history. Buy now. It is a real bargain offer.

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The Model 5 includes every essential feature found in standard typewriters. It has standard 4-row keyboard, Complete visibility, Standard width carriage for long envelopes. Carriage return lever of exceptional design for easy and rapid opera-

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